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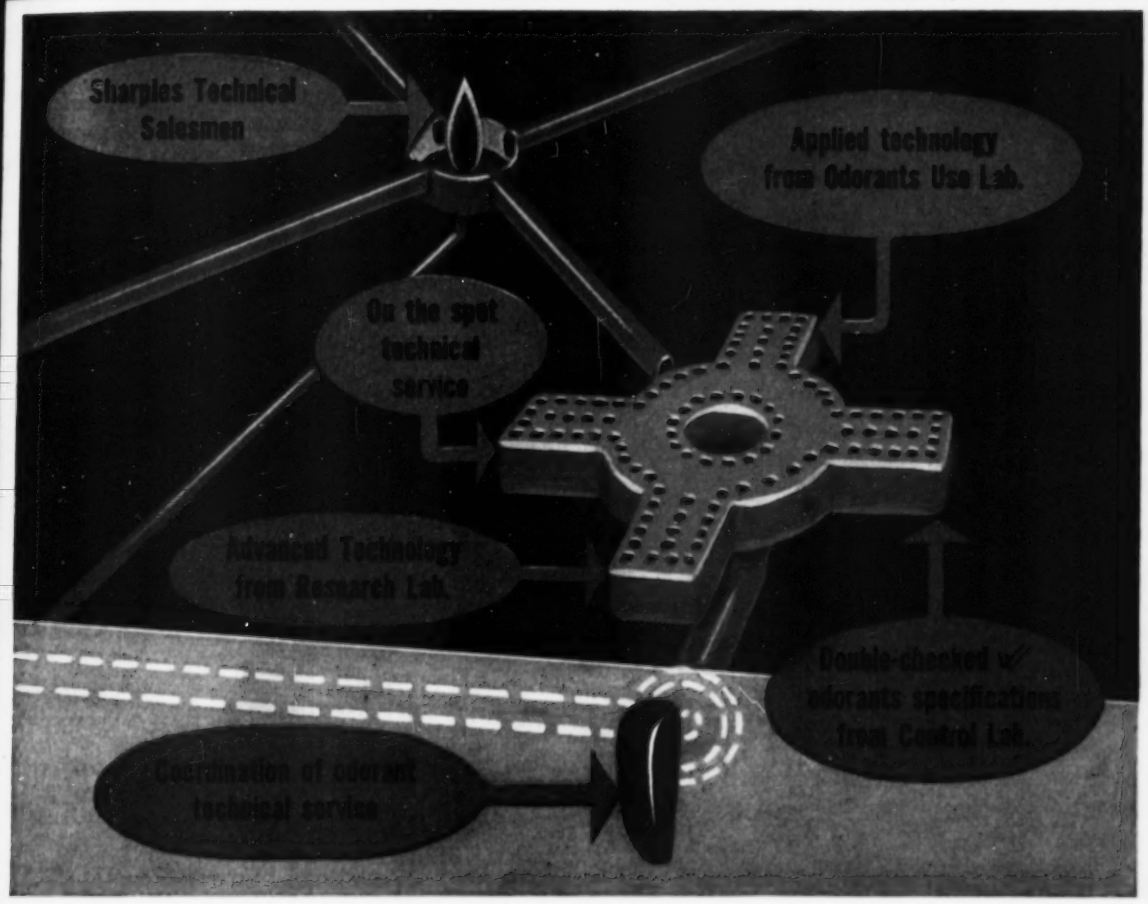
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GAS

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

Search begun for gas in eastern Oregon

El Paso Natural Gas Co., whose exploratory activities on the Western Slope of the Rockies and throughout Utah have been stepped up considerably in recent years, is reportedly ready to put down a well in Mahheur county, 50 miles northwest of Boise, Idaho. Oregon, along with Washington and Idaho, has no commercial production of oil or gas at present. El Paso is fast assuming a dominant position in the supply situation in the West and Far West.

Annual parade of deaths by gas begins in New York

With winter coming on, the situation in New York is described by the New York *Times* as (on the basis of mortality figures) "neither an improvement nor an amelioration, but a frightening maintenance of the status quo." In mid-November, the fatality count for 1954 had risen to 88, close to the average over the past four years, which has seen a total of 400 die from faulty gas appliances and installations. With vast areas of substandard dwellings, owned by reluctant landlords, to contend with, city officials appear to be faced with a problem that has no solution.

Business on upgrade, with further gains seen in 1955

Anticipating the year-end rash of business forecasting, a number of business leaders have jumped the gun with predictions for 1955. Consensus: good, getting better. Encouraged by the resistance to a real recession in 1954, E. B. George of Dun & Bradstreet foresees a continued upturn along most lines (although a drop in producers' durable goods expenditures of $1 billion), including an $11 billion increase in gross national product. No boom in 1955, however. Tax cuts and "built-in flexibility" in our economic system helped us this year, he believes. Allyn P. Evans of Lionel D. Edie & Co., New York, believes growth in 1955 will adhere to the 4%-per-year average, with a $14 billion jump in gross national product. Consumer pressure to raise the standard of living, restrained by war-induced taxes, will be the No. 1 force for prosperity, he believes. Ben Fairless of U. S. Steel forecasts a boost in steel production of from 5 to 10 million tons, thinks 1955 will see moderate gains all along the line, with rapid expansion in business coming in the late '50s. A Dun & Bradstreet survey of 1309 executives showed a majority optimistic over the probabilities of an upturn in sales. And Dodge economist, Dr. George Cline Smith, declares that today's record-breaking construction tempo is well below boom proportions and foresees continued expansion in the next year.

Fossil fuels' life span set at 95 years

M. E. Spaght of Shell Oil Co. thinks the world's sources of oil, natural gas, coal, and oil shale will be exhausted by the middle of the next century, unless greater efficiency is obtained in their use. Growing energy demands and growing usages are cited. Atomic power will provide much more than 20% of our energy by 1985, he thinks.

IBR finds new methods of cooling, using hot water steam systems

A $1000 installation price for the complete installation of an integrated chilled-water type summer cooling system for medium sized homes, for use in combination with forced hot water and steam heating systems, is now possible, says the Institute of Boiler and Radiator Manufacturers. Research has brought new methods of calculating cooling loads, more precise sizing, new installation techniques that lower costs and make for more efficient operation.

Servel to market built-in refrigerator

At last month's annual meeting of the Society of Industrial Designers, Vice President Donald Dailey of Servel revealed his company is planning to sell wall-type refrigerators. No marketing date was disclosed. Servel's decision bears out widespread predictions of further realigning of kitchen equipment, including development of refrigerating and cooking "units" that will promote household efficiency.

FPC's Order 174-A still has producers in tizzy

Through Nov. 17, 850 producer applications to sell gas to interstate pipelines had been filed with FPC. Sixty-two had been approved. Hearings were continued in connection with the enforcement of Order 174-A, on many fronts (including the courts). For a roundup of developments (through mid-November) see pages 46-47.

Matters for Management

Will producers find substitute outlets for gas?

Given the status quo in the regulation-of-producers situation, with the producers straining to squeeze through their escape clauses and gas buyers finding it increasingly difficult to secure reserves commitments, the question everyone is asking is, "Just how far can these producers go in finding substitute outlets?"

There are, of course, two alternatives. One is to find local, intrastate markets for the fuel. The other is to look to

Thermally Thinking

new uses in which gas is the raw material. The petrochemicals field falls in this latter category. So it's pertinent to inquire into the potential gas consumption of this growing industry.

Speaking before the division of production of the API in Chicago last month, T. G. Hughes, president of the Oronite Chemical Co., San Francisco, quoted some authoritative estimates of the President's Materials Policy Commission relating to the question. This year the manufacture of petrochemicals will total about 30 billion lb, with a value of $7.5 billion. By 1975, according to the commission, the total will run to 54 billion lb. Yet today, less than 1% of the total gas *and* crude oil produced in this country is "winding up in petrochemicals." And, if the commission is right, "by 1975 the chemical people will be consuming about 2% of total oil and gas production."

In terms of volume, in 1950, 180 MMcf per day was going into petrochemicals manufacture, while in 1955 this is expected to rise to 390 MMcf per day. By 1975, the figure will be 870 MMcf.

Furthermore, as Mr. Hughes pointed out, petrochemicals can be made from coal, wood, molasses, or corncobs, and it's only because gas and oil have been relatively inexpensive that they have found a good demand in this field. It's conceivable that corncobs could eventually win the whole market.

Then, too, petrochemical manufacturers insist on long-range supply and strategic location. Freight rates of the finished products are an important element. Summing it all up, Mr. Hughes is extremely doubtful that the petrochemicals tail will ever wag the petroleum dog.

An Eye on the Capital

Industry associations tell a convincing story

Should the President's Cabinet Committee on Energy Supplies and Resources Policy eventually recommend the formulation of a repressive "National Fuels Policy" damaging to the cause of gas (which it has so far given no indication that it will), it would not be because of any failure of the AGA and other gas associations to state their case, and state it well.

The AGA-sponsored study, "Gas—and Its Service to the Nation," which a committee composed of Howard Noyes of Washington Gas, J. French Robinson of Consolidated Natural, and E. P. Noppel of Ebasco put together for the cabinet committee, is a sound brief. In touching upon the problem of fuel competition, the committee summed up its case this way:

"The coal industry is making numerous complaints that natural gas has invaded its market and reduced its output. Segments of that industry are urging administrative and legislative action to restrict the use of gas so as to force the use of coal. However . . . the growth of demand for gas has been dictated by the householder, the business, and the factory because of their need and demand for a clean, automatic and reliable fuel at reasonable prices. The coal industry has a free and open opportunity to reach these same ultimate consumers and provide them with the service they desire.

"The strength and welfare of the country would not be fostered by repressing and holding back the enterprise of the gas industry so as to force the consumer to use a fuel other than that of his choice. The strength and welfare of the country can best be improved by not interfering with the force of enterprise so that each industry must improve itself in order to compete."

As is obvious from the summation, the coal industry has taken advantage of one more opportunity to attempt to have its most effective competition killed. By its own admission a "sick industry," unable to compete on even terms, it seeks to hobble a sound industry by government fiat.

The AGA committee has pinpointed the dangers of such a policy. The report reveals the fact that the funds to finance the expansion of the industry have come from the public, and "it is essential to the welfare of the country and to its expanding industrial economy that these investments be protected." Before the demand for gas began exceeding readily available supplies, "large quantities of gas were wasted, flared into the air, or burned for carbon black." An artificial restricting of this demand would bring new wastage. "For the country to develop and secure the full reserves of gas that lie within it, there must be an expanding market."

Gas is important to defense. "Any restriction on the supply of gas for industrial purposes will limit and in many cases close down production. This could result in widespread unemployment. In war, there would be a disruption of all important production schedules."

Municipal and state regulations requiring utilities to render adequate service on a non-discriminatory basis and reasonable rates, must be considered, the committee report declared.

Gas is important to industry. "The expanding use of gas in industrial plants is occasioned by the same considerations which dictate use of gas by the householder. Industry demands a clean, automatic fuel. . . . In many important industrial processes, gas is the only suitable fuel." The committee appended a list of 13 general types of industrial operations and applications where gas service is essential to the process, breaking down these classifications into more than 100 specific uses.

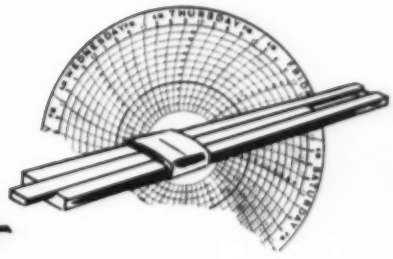
Boiler fuel usage is, of course, what most chagrins the coal people. But the committee shows that "in the northeastern part of the country, where coal is plentiful, gas represents only 7% of the fuel used under boilers for power generation." It is only in the Southwest, where natural gas is plentiful and coal is not, that gas enjoys 99% of this load.

The committee also carefully points out how the use of a higher priced fuel under boilers would raise electric rates and how the load factor made possible by cheap off-peak rates keeps gas rates reasonable for the domestic consumer.

It's a bit difficult to see, on the surface, how coal can gain its competitive ends through the subterfuge of a "national fuel policy." The Paley report of several years ago did nothing for the industry. And Interior Secretary McKay, one of the cabinet committee members and certainly a key figure in

Continued on page 67

Technical Trends



• By GUY CORFIELD

Developments in atomic "fuel"

Now that the atomic energy law has been revised to permit industry to obtain fissionable materials from the government and use them in nuclear reactors, and enjoy some of the privileges of discovery and patent coverage, increasing interest is manifest in plants employing nuclear energy as fuel to produce power and heat, and predictions are being made that such fuel will be commercially competitive to coal in from five to 10 years. While others think that this may be optimistic, and that government subsidies will for some time be required to equate the atomic and conventional power producing costs, there seems no doubt that nuclear reactions will provide the power for very long range ships, submarines and even airplanes, and can also furnish power and heat at remote or inaccessible locations to which normal fuel transportation is very difficult and expensive.

There are some basic aspects of nuclear energy that appear to be limiting factors. It is now costly as compared to other fuel sources, but regardless of present or future cost it is in such a concentrated form that it can be used for purposes that no other energy source would serve at any price. The radioactive rays from the reactor make it necessary to provide very thick and heavy shielding, so it is most appropriate for stationary installations or purposes, and least attractive for light vehicles that can be readily refueled by conventional means. But perhaps the potentially greatest problem is the disposal of waste fission products, the present expedients such as collecting in underground vats, or dumping into the ocean in concrete kegs, not appearing to be continuously practical.

The first central station nuclear plant to be built in the United States will be at Shippingport, Pa. The reactor will be constructed by Westinghouse and owned by the Atomic Energy Commission, but the steam-electric portion will be owned by Duquesne Power & Light Co. of Pittsburgh. The cost will be about $43 million, of which $33 million will be put up by AEC. The core of the reactor will contain about 10 tons of enriched uranium. Heat produced by uranium fission will be transferred to heat exchangers by water under 2000 psi which will be heated to about 575° F. Heat released in the exchangers will be picked up by low pressure water, producing steam which will go to Duquesne's turbines to develop an estimated 60,000 kw. While power thus produced will be higher than normal cost, the power company will pay AEC a normal price for this steam and charge its customers regular rates.

The Atomic Energy division of Babcock & Wilcox Co. has placed on the market two relatively low cost atomic research reactors, which B&W states are "adapted for use in training badly needed personnel for the nuclear power industry, as well as for conducting basic nuclear research and development." These reactors will sell in the range of $100,000 to $150,000. One is a "water boiler" type, using a uranium sulfate-water mixture, and cooled by circulated water from an external source; the other is a "swimming pool" type in which the core, which can have several different designs, is cooled by recirculating water from the surrounding "pool," which is 10 ft wide by 20 ft long by 25 ft deep.

Following successful development of a reactor to power the submarine Nautilus, the Army is inviting private industry to bid on and build a 1700-kw nuclear power plant that can be transported in sections by cargo planes, for installation at remote military bases. It will be the same in principle as the Westinghouse design, consisting of an enriched uranium reactor cooled by high pressure water, which, in a heat exchanger, will convert low pressure water into steam. The steam would be used partially for heating and partially to drive an electric generator. It will be designed for installation in a building approximately 29 by 80 ft, 42 ft high, and is expected to cost between $4 million and $8 million.

In the field of engineering education, both Polytechnic Institute of Brooklyn and Illinois Institute of Technology are offering nuclear courses to their chemical engineering students. These courses will include basic nuclear physics and chemistry, followed by elements of reactor design, leading through to practical energy production starting with raw material and finishing with waste disposal. Also 76 engineering students have just graduated from a special one-year course at the Oak Ridge School of Reactor Technology; 18 of these engineers are AEC employees, 20 are from other government agencies, nine are industry employees and 29 are recent college graduates. To complete the picture, formation has just been announced of the Society of Nuclear Scientists and Engineers, with headquarters at 329 W. 41st St., New York 36, N. Y., and plans have been made for a first technical conference of this society at Pennsylvania State University next June.

Meanwhile, the search for and production of uranium is increasing in tempo. The Atomic Energy Commission and the Geological Survey are planning to drill 1,120,000 ft of exploratory holes in the Colorado plateau, and private industry will probably drill twice this distance; and AEC is offering a variety of production incentives including price guarantees and bonuses.

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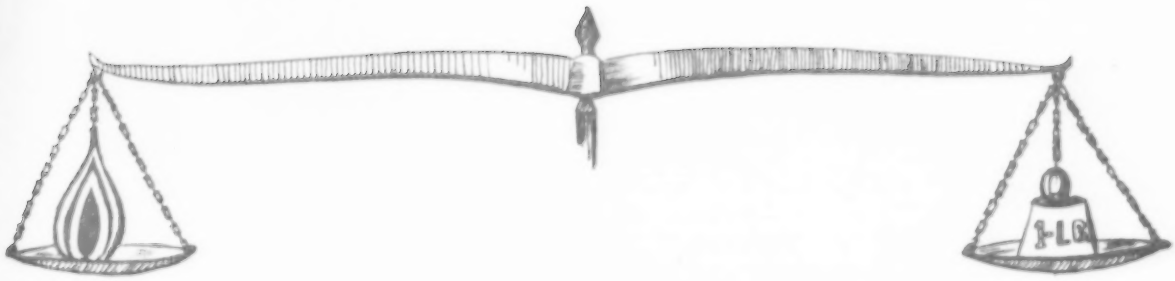


A pound of gas?

... that's not as farfetched as it may sound, according to a top metering expert

By HOWARD S. BEAN

A *POUND* of gas?

Yes, in the wholesale metering of natural fuel gases with the orifice meter the unit of measure might well be the pound. But a pound of gas? Why? How will we define it, or rather its conditions, and what does a pound of gas look like?

Conditions for weighing

Well, it would not be necessary to specify the conditions (i.e., pressure and temperature) for the weighing; many commercial gases are sold by the pound now without regard to pressure or temperature, and of course the pound would have the same weight value as if we were selling wheat. True we could not see a pound of gas, but neither can we see a cubic foot of gas, and while it may be difficult to visualize the weighing of gas like we can the weighing of wheat or water, it can be weighed.

As to why: briefly, for simplicity and economy. For that matter, we are doing that now, only we go on and make additional measurements and introduce arbitrary conditions in order that the result may be expressed in some other unit, a cubic foot at some condition totally unassociated with the conditions of measurement. All of this means additional work and additional opportunities for errors.

Basic equation

Let us examine, briefly, the basic equation used in metering gas with an orifice. The first step in deriving this equation is to equate the total energy in a pound of gas (*not* a cubic foot of gas) on the inlet side of the orifice to the total energy that pound of gas will have on the outlet side of the orifice. From this, and the fact that for every pound of gas that comes to the orifice another pound has passed through, we can derive the rather simple relation

$$w = 0.525\, d^2\, K\, Y \sqrt{\Delta p\, \gamma}$$

in which

- w is the rate of flow, in lb per sec
- K is the flow coefficient, a ratio
- Y is the expansion factor, a ratio
- d is the orifice diameter, inches
- γ is the specific weight of the gas as it reaches the orifice, lb per cu ft
- Δp is the differential pressure, lb per sq in

The numeric 0.525 takes account of the units in which the several factors are expressed and also the gravitational factor.

Now, partly because it started that way, it is the general practice to make a number of modifications to this relation. First, Δp is replaced by its (approximate) equivalent in inches of water column. Now an inches of water is a very useful unit of pressure, and one easily visualized, especially if an actual water column (in a glass tube) is used. Its use here is not objectionable since it introduces no real difficulty; however, it may be noted by way of detail that actually this pressure is almost always measured by some form of pressure gauge. The actuating element of this gauge may be a float in a mercury chamber or a pressure bellows. Hence, it would be just as easy to have this gauge indicate in some other pressure units, as, for example, pounds per square inch.

Temperature assumed

Next, γ is evaluated in terms of the gas temperature (which is more often assumed than measured), the (static) pressure of the gas, its specific gravity, and very frequently the supercompressibility also, these last two being determined directly or indirectly by auxiliary

measurements. Finally, in order that the flow may be expressed in cubic feet at some preferred condition of pressure and temperature, which may be very different from the pressure and temperature at the time and place of measurement, additional factors are incorporated into the computations. Oh, yes, many of these factors are considered to be constants and are combined into a single factor.

Mr. Bean is chief of the capacity, density, and fluid meters section, mechanics division of the National Bureau of Standards. A rundown of his work would include: director of field tests on orifice meters, preparation of fourth revised report on fluid meters, chairman of ASTM committee on measurement of gaseous samples, chairman of AGA-ASME committee on extension of orifice meter studies, and author or co-author of more than 30 papers on fluid metering.

Ideal instrument

In contrast, how simple it would be if one instrument, or one element of a combination unit, measured and recorded the differential pressure in psi. Such a gauge could have any suitable range such as 0 to 2, to 5, or to 10 psi. Then another instrument or another element of the combined unit would measure and record the actual specific weight of the gas as it reaches the orifice. Measurements or determinations of static pressure, temperature, specific gravity and supercompressibility would not be necessary as far as metering is concerned.

The extension of Δp and γ could be obtained on an integrator, and combined with the other factors in the above relation to give the pounds of gas. Also, if the time unit is to be a minute, hour, or day, we have only to multiply the whole by 60, 3600, or 86,400.

But what about the expansion factor, Y, which is now keyed to the ratio of differential-to-static pressure? Well, for the range of conditions usually encountered in fuel gas metering, we could relate Y to the ratio of Δp to γ, and prepare tables on that basis. This would probably involve the use of some approximations, but since the value of Y is seldom far from unity, such approximations would have an insignificant effect upon the final measurement. The Reynolds number factor, F_r, also may be keyed to Δp and γ.

There is another important advantage to using a pound as our unit for the wholesale metering of fuel gas. Slowly, but inexorably, over the past 30 years, it has become generally realized that fuel gas represents energy in the form of deliverable heat, so that now the heating value of the gas is an important element in establishing its monetary value. The heating value of a pound of dry gas (i.e., free of water vapor) is the same whether it is in a pipeline at 1000 lb pressure on a wintry day, or at the conditions of use in a Denver home in midsummer.

Now wait a minute, you say, I have to dispose of our pound of gas to the end user. Agreed, and the vast majority of ultimate users, both in numbers and quantity of gas used, are the domestic consumers. For measuring the gas to them, the established and reliable diaphragm gas meter will continue to hold sway. Therefore, somewhere between the wholesale meter and this house meter we must find how many cubic feet there are in our pound of gas. However, it is the cubic feet at the conditions of the users' meters in which we are interested and these conditions are, for all practical purposes, atmospheric conditions, or very close thereto.

Retail conditions

Furthermore, when we talk about so many M cubic feet of gas per day, in either a transmission or distribution system, we are referring to cubic feet at these retail conditions. Hence, it will be entirely sufficient if we determine with the aid of our specific gravity balance the pounds per cubic foot. Then the reciprocal, cubic feet per pound at atmospheric conditions or possibly an observed or assumed "average" condition, that is, of pressure and temperature, can be determined quickly.

Heating value? Yes, I did indicate that the heating value of a pound of gas is independent of the pressure and temperature. How do we get it? Well, at present there seems to be no practical way of determining this directly, and we must continue to use the very well established methods of first determining the Btu's per cubic foot. Since these methods involve the burning of the gas they are always made at atmospheric conditions. Thus again the relation between our pound of gas and a cubic foot of gas can be made at atmospheric conditions.

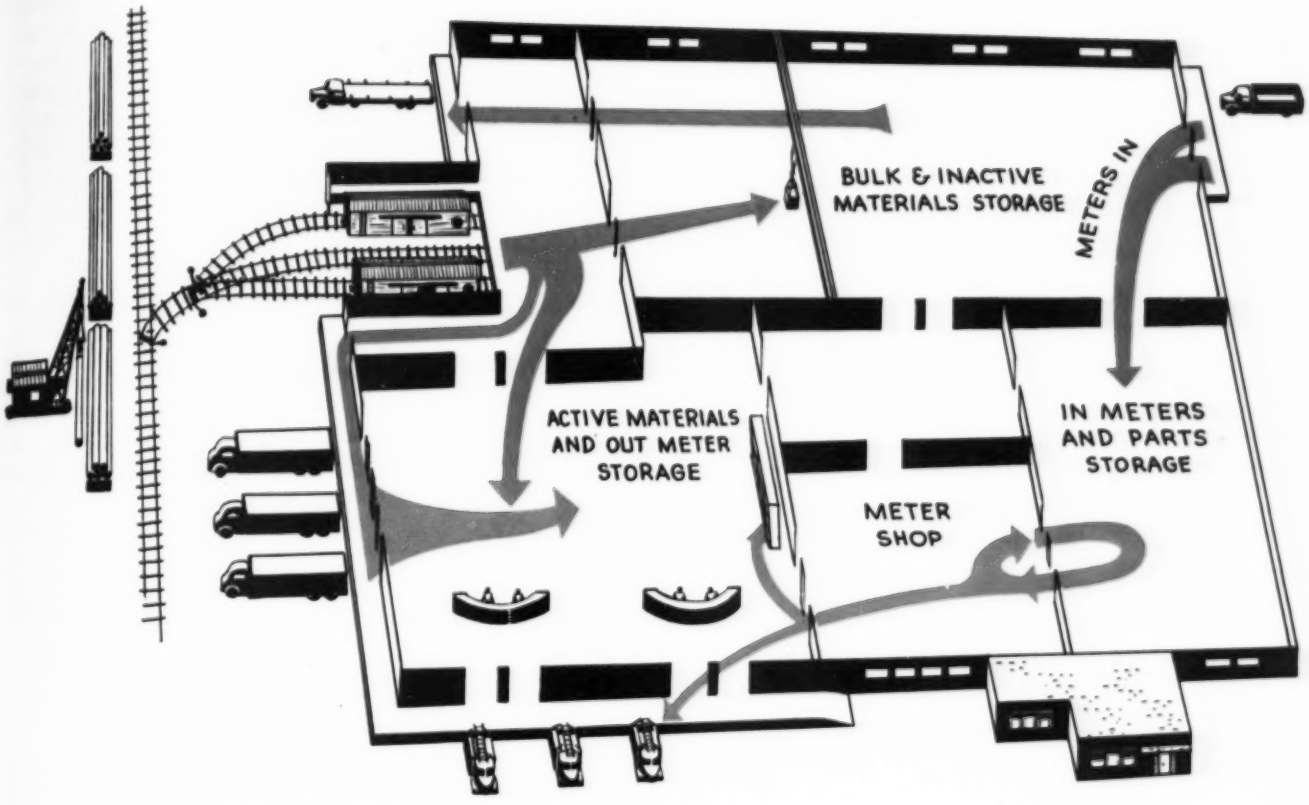
Back to the beginning

Well, then, what's the use of considering a pound of gas? Doesn't all this bring us right back to where we are now? The answer is: no, not all the way back. True, at the retail level, which is substantially at atmospheric conditions, we still have to relate our pound to cubic feet. But for the wholesale measurement with an orifice meter and at present-day line pressures, using a specific weight recorder and computing the pounds of gas will eliminate—

the supercompressibility factor
the flowing temperature factor
the specific gravity factor
the pressure base factor
the temperature base factor.

But, you ask, are these not "paper advantages" since there is no instrument which will record the specific weight of the gas? So why bother? Ah, maybe there is no such instrument as of today, but soon there may be such an instrument. The instrument makers of our country have solved more difficult problems than that.

Well, you contend, the concept of a pound of gas is just too intangible to become accepted by even gas measurement men—they will laugh at the idea. Maybe they will laugh at it, but if it has merit they will adopt it too, because they are always looking for improvements, as shown by their ready adoption of many improvements in the past few years.


BULK & INACTIVE MATERIALS STORAGE
METERS IN
ACTIVE MATERIALS AND OUT METER STORAGE
IN METERS AND PARTS STORAGE
METER SHOP

WAREHOUSE DESIGN

By J. FRED EBDON • Managing Editor

As Part 3 in the occasional series on materials handling in the gas industry, basic considerations of good storage and flow are contemplated. Trends in design are bringing decentralization of facilities, separate unloading and loading platforms, careful segregation of materials according to shelter needs and other new concepts. But no matter what types of plant layouts are desired, the scientific approach in allocating space is becoming an important ingredient in planning for efficient warehousing.

WAREHOUSE space is the basic commodity and resource of the storekeeper; it follows, then, that the way in which space is used is the critical factor for determining efficiency and utility. Most experts in the field agree that the more efficient operations are those that have the best utilization of space commensurate with efficient, mechanized, materials handling equipment. Most gas companies are interested in good warehousing and storage because the rapid expansion of the industry has necessitated either construction of new facilities or plans for new construction and the enlargement of existing properties.

These words cannot replace the need for specialized consultants, engineers, and architects, nor can they abrogate or circumvent the duties and responsibilities of gas company engineers charged with designing and planning. However, it is intended that they serve as a guide for those charged with the task of increasing warehouse and storage facilities.

First, it is important for interested personnel to recognize the need for new or enlarged storerooms, pipeyards, and associated offices. Studies should be developed to prove this need and justify the expense of expansion. Next, management should be apprised of the results of these studies to keep them abreast of the changing storage needs and to gain clearance for further study. At this stage of development, studies should be initiated to produce such influencing factors as:

Warehouse design ... The modern trend is to decentralize plant facilities

1. Job breakdown chart.
2. Work count.
3. Work volume record.
4. Standard procedures.
5. Flow charts.
6. Space requirements.

These factors should give rise to enough material to enable a general plan of operation and final cost to be made for the consideration of management. From that point, only short steps are required to remove the project from the theoretical and proceed with the development of a proper general location, with respect to operations, and the selection and purchase of land.

Location of storage facilities

Most gas companies will prefer to locate their warehouses and yards away from blighted neighborhoods. This tends to ease the personnel problem, but often is impractical because of budget considerations and real values placed on land. Conversely, it is not prudent to locate such installations in neighborhoods where they are liable to cause friction with the surrounding land owners. Perhaps compromise is the best solution to this vexing problem; but in any case, the projected growth or deterioration of the territory must not be neglected.

The storeroom and yard should be near major traffic arteries, for obvious reasons. Also, the availability of railroad spurs is a factor if rail shipments or deliveries are contemplated. Checking with the local railroad people can prove a profitable investment of time in this matter.

Other factors that should be considered when selecting a site are:

1. Adequate civil protection.
2. Effect of city, county, or state regulations.
3. Availability of public utilities.
4. Labor supply in the area.
5. Availability of public carrier pick-ups and deliveries.
6. Parking space required and area available for this.
7. Availability of public transportation for employees.

The modern trend in utility management is to decentralize plant facilities. This trend is particularly noticeable in the larger cities. There are many inherent advantages to be gleaned from the use of several relatively small service centers (each with some warehouse and pipe storage space), spotted in carefully determined locations about a city, over a centrally located large facility. Careful study should be given to determine which major plan would result in the greatest economy for a particular locality. Perhaps, in summation, it would be well to say that consideration of the total company operation cannot be neglected in the centralized vs. decentralized decision.

The storeroom

Storage of materials is all inclusive. Some of us may not realize it means the assembling of thousands of items—purchased for the maintenance, operation, and construction of the gas business—into logically related groups, codes, accounts or classes at storerooms or warehouses. These items must be sorted, identified, and accurately and properly prepared for storage. Actual storage, in turn, must be accomplished so that it conserves space and time, and affords the utmost protection—all this so that the many items can be readily inventoried and located as required for issue.

Purchasing and stores people consider two factors of prime importance in the layout of available storage space, the "commodity factor" and the "capacity factor." They generally agree that equal consideration must be given to both factors, since one influences the other throughout an entire storage operation.

Commodity factor pertains to the physical characteristics of the supplies to be stored, and would involve the size, weight, and shape of material. All of these have to be considered when making a storeroom layout, so that heavy or bulky materials will have a shorter distance to travel than those items that are light and easy to handle. Turnover is another index to the commodity factor; efficiency is increased if items that are constantly in demand are located close to points of delivery and issue.

The capacity factor is the characteristic that physically describes the storage area. This would include the locations, number, and sizes of doors; floor loads

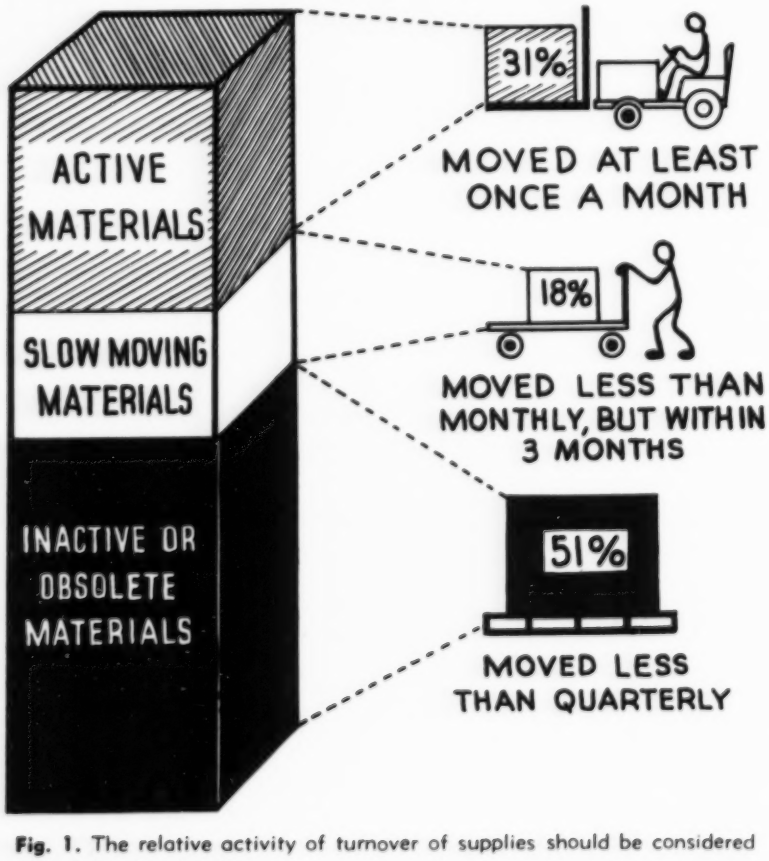


Fig. 1. The relative activity of turnover of supplies should be considered when planning locations.

Fig. 2 (above). Frame pallets, which are considered to be the most flexible storage aid yet developed.

designed for; size and location of platforms and ramps; height of ceilings; lighting values; heating system and/or controlled atmosphere; handling equipment, etc.

List of supplies

The first step in storeroom layout should logically be the preparation of a current list of all types of material received, stored, and shipped. This action can be coordinated with a program designed to eliminate dead and obsolete stock items. Also, much thought should be given to the determination of the quantity and types of appliances or other bulky material that will be handled.

When actively planning the location of supplies, the relative activity or turnover is the first consideration to be weighed (see *Fig. 1*). Small lots moving daily should be stored closest to the issue area, because items that are active will require many trips between the bulk storage area, bin stocks, and issue area. Much time can be saved by keeping this trip distance short. In short, a study must be made to determine high and low turnover items for location purposes.

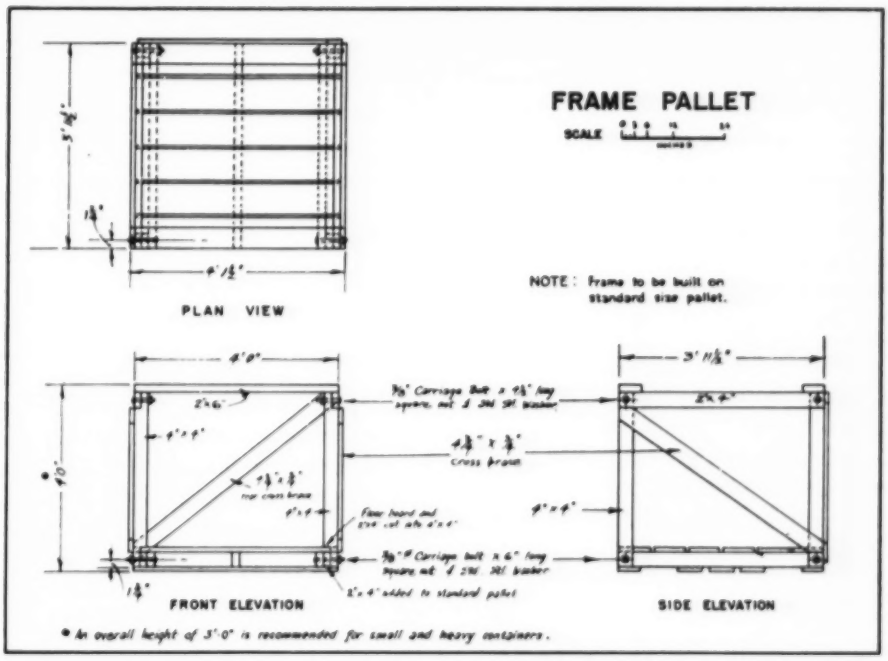
There are basically four classes of quantity lots, large lots, medium lots, small lots, and bin storage; however, recognition must be given to the existence in some classes or groups of materials of the "in-between" lots. These are items that have long vexed the storekeepers as they are too large for bin storage and too small for efficient storage by space in pallet racks or frame pallets. These in-between quantities may represent all of a particular item, and these racks or pallets can be used much in the same manner as open stock. In other words, these in-between stocks should not be used as an intermediate stopping point in the storage cycle, but are a back-up or bulk point for bins, in some items, and the active issue point for larger items not carried in bins.

Storekeeper's delight

Unfortunately, there are many buildings that must be used as storerooms that are actually not well suited for this purpose. A new, well-designed storage building is the storekeeper's delight, but the construction of a new facility is not always practical. The planner must, in any case, analyze what he has available so the good feature can be recognized and the deficiencies considered. As a case in point, storage people consider warehouses with high ceilings and high floor loads as those which can be utilized to a greater extent by economical high piling and pallets, while the capacity of low overhead buildings in the storage of large lots is reduced considerably when pallets are used.

Space within a storeroom generally must be allocated for administrative offices, preservation, packing, shipping, receiving, storage, and issuing. The warehouse planner must conceive a layout within these limits that permits the maximum of supplies to be stored, but will also facilitate the handling of these supplies with a minimum of labor and time.

Fig. 3 (below). Typical construction drawing for frame pallet.


FRAME PALLET
SCALE
NOTE: Frame to be built on standard size pallet.
PLAN VIEW
FRONT ELEVATION
SIDE ELEVATION
* An overall height of 3'-0" is recommended for small and heavy containers.
NAVY DEPARTMENT

Aisle location

A prime factor of good layout is the location, size, and number of aisles. Aisles are usually governed by the physical size and shape of the building, location of fire protection valves, elevators, columns, handling equipment, etc. Some of the important factors that should be given thought when laying out aisles are:

1. That part of the supplies that are to

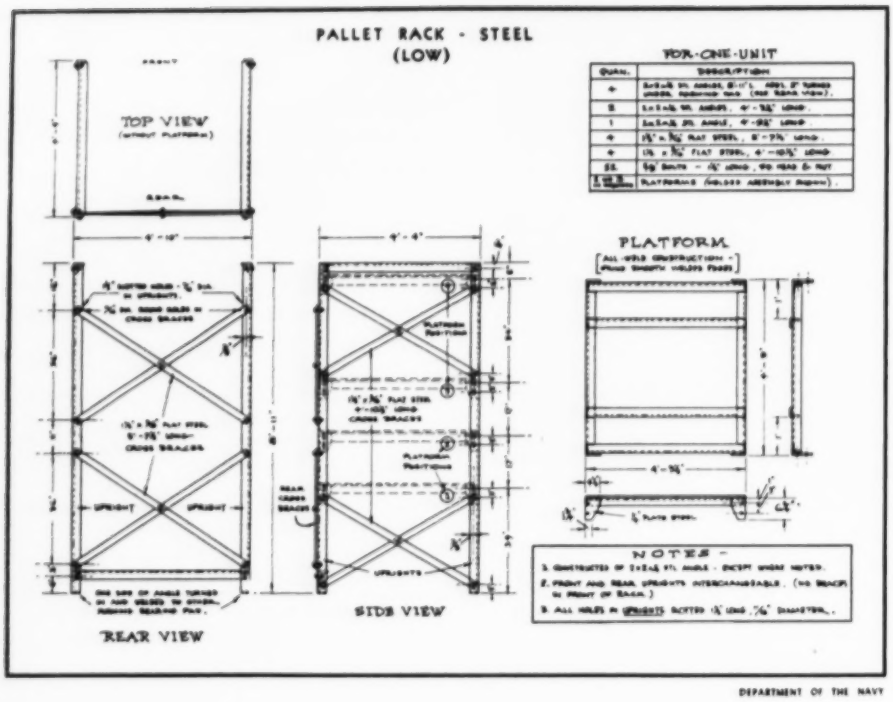


Fig. 4. Construction details of a well-designed pallet rack.

be block stacked, stored in frame pallets, or in pallet racks placed back-to-back.

2. Distance to doors and loading platforms.

3. Locations of fire walls, and the location, spacing, and size of columns.

4. Type and size of materials handling equipment that will be used.

5. The over-all flow diagram for the warehouse operation.

The storage-method plan must enter into the layout stage for the efficient storage of gas company material. Most storekeepers are well aware of the many benefits resulting from pallet load building, but gas company storekeepers have found that the quantity and physical characteristics of some materials do not lend themselves well to this type of storage. Many storekeepers then turn to frame pallets *(Fig. 2)* as these are considered to be the most flexible storage aid yet developed. A typical construction of this aid is shown in *Fig. 3*. The frame pallet is usually loaded and then removed to a pallet rack (*Figs. 4* and *5*).

Layout of the storage room must take into consideration those items that are flammable. Some local codes and regulatory bodies require the elimination of such items from warehouse buildings. The storekeeping must keep abreast of such rules and pay particular attention to border-line materials.

Sufficient space should be available to assemble materials needed for specific jobs. This will be particularly true as gas companies continue to develop their standard practices and issue standardization manuals. It is conceivable that construction forces will appear at issue areas with requisitions or work orders calling for those materials required to install a standard district regulator station, for instance, and the multiplicity of fittings, pressure control equipment, insulating materials, and other equipment required will be assembled in short order or issued as a package. All of this will require some assembly space.

Floor storage space should not be neglected. Very large and heavy items simply require floor space and are not very economically stacked because of the extra design and floor loadings that must be provided to accommodate the high density bulk. Large valves and fittings are likely to fall into this class of material. Also, it has been found that ladders and other awkward items take much floor space.

Large operations will have much materials handling equipment that will have some effect on the storage area layout. The design should consider the average distance traveled by fork-lift trucks and their maximum travel distance. Then, there must be a parking space for lift trucks, hand trucks, dollies, and so forth. The fueling and maintenance of some of the equipment will take space and must be provided for. In most cases it will be well to locate such facilities a short distance from the warehouse to eliminate the danger of fire, etc. In some cases local regulations will have some provisions affecting this operation.

Try to get all operations on one floor. This is, perhaps, a rather ambitious goal in view of the present real estate values, but the one story has proved ideal. If more than one floor is necessary, sufficient elevator capacity is required if it is desired to operate an efficient warehouse. Otherwise, the work of moving materials will be slow and inefficient.

Emergency equipment is needed in a hurry; hence, some easily accessible and adequate space for it must be provided. There can be little utility gained from this classification if it takes much time to locate, move, and load the material.

The building

An expensive, attractive, and large building is not always the answer to the storekeeper's problem. Everyone knows that it is highly desirable to be able to work from the ground up with entirely

Fig. 5. After the frame pallet is loaded, it is removed to a pallet rack.

new facilities, but this is seldom possible. Basically, the building, old or new, must be fitted and/or altered to fit the needs of a warehouse.

As has been previously stated, the one-story structure is considered ideal, but if more than one story is required, the elevator capacity must be adequate to prevent slow-down of moving items. A few dollars spent to increase this capacity often pays out in savings realized from unloading freight cars in relatively short times and reducing labor hours.

Ceiling height for gas company service store areas should be 12 ft, while the height in bulk storage areas should be not less than 20 ft or more than 30 ft. Of course, the type of materials handling equipment available or planned will influence this. In this respect, one cannot excuse the need for double checking the clearance height below electric conduits; heaters and warm air ducts; intercom, gas, air, and water lines; and, most important, the clearance below trusses. The clearance from the floor to any and all overhead obstacles should be greater than the maximum mast height (on lifting equipment) plus the load. Proper overhead clearances at platform doors, and interior passageways must also be checked. Naturally, door widths cannot be ignored in the design stage.

In general, cantilever or monitor roof construction leads to better warehousing techniques. Natural light can be let in easily and the freedom from columns adds grace and convenience to storage work. If columns must be used, their location in the building must be planned and checked in detail.

Most designers are well aware of the advantages gained through the use of planned, adequate lighting. Most power companies can provide an excellent consulting service to help with this problem. It is not a thing that can be solved by those not trained in the technique. The first step toward adequate lighting is to be assured that the proper conduits and outlets are located correctly and that they are adequate for all electric services required, yet allow for a reasonable future expansion. Most cities have ordinances that set down basic electrical installation rules. (Remember, these rules are minimum standards.) As much natural light as possible should be provided; however, some artificial lighting will usually be necessary. Don't accept a building plan that has not been checked and double checked for adequate shelf, bin, and aisle illumination. As a very rough rule of thumb, one fixture for every 18 ft of bin length has been found to work out well. The size of the fixture, its height and orientation with respect to the bins cannot be passed over, however, so it is well to obtain the services of competent engineers for this phase of the planning.

Warehouse design ... It is best to provide separate unloading and loading platforms

Loading and unloading platforms are important to the efficient flow of material. Most warehousemen agree that it is best to provide for separate platforms to receive and issue materials. They should be at railroad car or truck height; however, there is no standard truck height, so the best solution to the problem is to install mechanisms that provide adjustment, such as a hydraulic lift platform or ramp. It has been learned that covered ramps and sidings fitted for all-weather use are well worth the extra expenditure (*Fig. 6*).

Many planners have found that platform widths in the range of from 10 to 14 ft are wide enough to allow for ample maneuverability of handling equipment. There should be adequate space in front of the dock or platform to allow large trailer trucks to be easily brought up without tying up traffic in public thoroughfares. This is ideal, but often hard to put into practice.

Floors should be at truck level and be constructed of concrete (or mastic) that has been treated for hardness and dust-proofed. There are many new flooring materials and coverings on the market today; doubtless some are very well suited to gas company material storage areas—some probably are not. Here again, the advice of known experts should be sought. Such people will have to make the computations for loadings. Ramp and dock flooring should be roughed; all other flooring should be smooth, but skid-proofed.

The tools of the storekeeper

Frame pallets lend themselves to a variety of loadings. For good storage, they should be loaded from back to front, but it has been found that several different items can be placed in the same pallet; hence, this device's reputation for flexibility is obvious. Careful placement of the several different items will allow direct access to any single item in the pallet. These "tools of the trade" are well adapted to the storage of items difficult to stack, such as brooms, shovels, regulators, odd-sized packages, and those containers that are weakly constructed or that have been damaged in transit. Frame pallets and pallet racks (see *Figs. 3* and *4*) are best served by fork-lift trucks; however, the fact that the first two levels can be serviced by hand should not be overlooked. In effect, the use of these aids develops additional space upon which receipts and issues are made by hand—the mobility thus gained is invaluable in rewarehousing. Frame pallets and/or pallet racks permit removal or entry without disturbing material directly above the wanted item.

The use of pallet racks should be governed by several variables. The weight and shape of the item is important. Also, the ability of the article to resist crushing or its ability to support weight

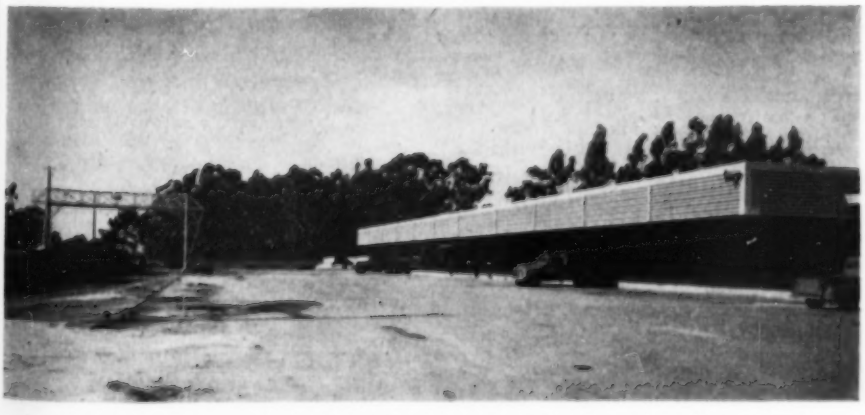


Fig. 6. Warehouse provided with covered ramps and sidings for all-weather use.

Fig. 7. This Rota-Bin, used by Consolidated Edison Co., makes maximum use of the space cube with a great degree of accessibility.

must be considered before it can be decided if racks would enjoy efficient utility. The similarity or diversity of the items must be questioned.

It would not be economically sound to launch a pallet rack storage program for those items that would readily be stored by palletizing on standard, straight pallets. Nor could their use be justified unless the necessity for, and importance of, varying degrees of accessibility have been evaluated. If the number of adjacent or supported pallets to be moved in order to reach the pallet desired is excessive, labor is wasted. Similarly, the following factors influence the efficient use of pallet racks and they should be checked for:

1. The amount of horizontal space available for storage and the percent of space gained by the possible use of pallet racks.

2. The cost and availability of fork-lift trucks and other equipment that can be used for lifting.

3. The minimum aisle space required for right-angle stacking.

4. The floor-loading capacity, column locations, overhead clearances, and storage area shape and size.

Bins and shelving can be readily used to produce cheap, efficient storage. The Rotabin has enjoyed unusually large acceptance in the gas industry *(Fig. 7)*. It is advisable to use standard components so that units are completely interchangeable. If the stock selector is to be provided with a short step-ladder, the shelves and bins should be not over 8 ft 3 in. high; 7 ft is about the maximum height for shelves that must be reached from floor level without the aid of any equipment. Depths beyond 18 in. are hard to work out of and should be avoided where possible. Dividers and inserts should be provided when it is desired to break up the storage space; however, these must be planned in order that they might be related to the size of the items to be stored. Most gas companies have found that bins and shelving constructed of approximately 16 or 18 U. S. std. gauge steel on a framework of light 1-in. to 1½-in. steel angles or tees have proved satisfactory, but the use of lightweight metals and alloys should not be overlooked. All of this type of property should be carefully computed for floor and shelf (or bin) weight. Wood has just about passed out of the picture for these purposes, and it would be rather inconsistent to install wooded shelving or bins in the modern warehouse building that is more or less fireproof or at least fire-resistant.

Efficient storage necessitates that bins, and some shelves, be clearly marked to show their contents. This is not too important in the case of shelves as long as the items or packages are well marked, but it is imperative that bins be equipped with label holders. The use of cross-arm or semaphore type signs at the ends of rows will be worth the added cost. Some companies go to great detail in marking the cards for card holders on bins, and report that this practice is sound.

Storage within bins should begin at the back, in the left-hand corner of the individual bin opening, and extend toward the front. For those classes that can be binned in sequence, the lowest stock number should be placed in the topmost opening at the extreme left end of a bin's section. The sequence should be maintained from left to right within the section, on each shelf level, so that the highest number in a section will be located in the lower, right-hand opening. In establishing a bin stock, it is advisable to leave one opening empty for each six filled bins for expansion, such as addition of new items or changes in quantity requirements.

Past issue should be used to establish a realistic quantity to be carried in each bin opening. In that connection, most gas company men are shooting at approximately 30 to 60 days' issue, or a standard shipping package, whichever is less. Seventy-five percent utilization of space within openings, in consideration for the foregoing statement, is considered as an acceptable performance. Cube losses beyond this figure indicate the need for some readjustment.

There are some other storage aids available; some of these are:

1. *Picture-frame pallet*—this unit seems to be well suited for the storage of crushable containers.

2. *Side frame and bracket*—this can be used in combination with a conventional pallet to stack irregular items of low density.

3. *Stow tables*—these are permanent racks that make use of the full cube which is obtained, provided the over-all depth does not exceed 8 ft.

4. *Dolly cradles* — these find efficient application in the storage and handling of odd-shaped items.

5. *Tree racks*—these are suitable for storage of small shapes, bars, etc.

6. *Dunnage collars*—these make it possible to build stable pallet loads of hard-to-stack items such as oxygen and actylene bottles, etc.

Whenever one dimension of a stable container (range, refrigerator crate, etc.) exceeds the width of a fork truck, short lengths of dunnage should be used instead of, and in the same manner as, pallets.

Hidden costs eliminated in mass record-keeping system

By **HERBERT W. RINGELSTEIN** • Rochester (N. Y.) Gas & Electric Corp.

LATE in 1953, when it became necessary to expand filing facilities for our credit history records, we ran into a situation that compelled us to review the entire operation. In the process we exposed and eliminated many hidden cost factors and discovered how to do a better job at less expense; and, at the same time, improved working conditions for our employees.

A credit history record is maintained for each of 150,000 customers billed from our main office. The record acts as a guide in the extension of credit and as an aid in making collections. It is initiated with the application for service and is maintained in an active file until final payment is received after termination of service. It is posted with such data as name and address, identification number, deposit and credit information, arrears posting, meter turn-ons and shut-offs.

The credit department of our customers accounting division maintains the record and furnishes all divisions of the company with customer credit information. The record also serves as a cross reference file for assignment of customer account numbers on various charges.

When the slide-visible files we had been using became overloaded by the constantly growing volume of records, and another file unit would be needed, we discovered that the 9.6 sq ft of additional floor space required was not available. It also was apparent that an additional clerk would be required if the files could have been spread over a larger area. The obvious solution lay in making a careful study of the entire credit history record operations to find a new way of performing it.

Our credit department formerly occupied 756 sq ft of floor space. One hundred square feet of this space was required for nine units of slide-visible files containing approximately 2000 trays. The credit history record was maintained on 6-in. by 7-in. visible cards folded to 6 in. by 4 in., filed according to the Russell Soundex system.

An analytical study of the former operation revealed hidden costs caused by the fact that records were spread over too large an area for efficient handling by five operators and one supervisor. Operators were kept so busy with nonproductive effort in order to post or refer to records that, had additional space been available for another unit of visible files, one additional operator would have been required.

Each operator was responsible for about 12 columns of files. To use them, an operator was required to leave her desk, walk to proper file column, locate the tray, partially pull out a lower tray, pull out the desired tray and rest it on the lower tray, find the visible card, turn and hold back preceding cards, lift the folded flap, post or make the reference desired . . . and then reverse this procedure for restoring tray and file. In addition, operators had to hold a telephone in one hand and a pen or pencil in the other for accomplishing many of these operations.

Each operator averaged 200 postings and refers daily. To accomplish them required performing more than 2400 separate operations, and walking more than 1200 ft per day. All operators complained that fatigue was slowing them down by mid-day.

Employees in adjacent departments complained that the visible files, stacked 6 ft high, were cutting off light and ventilation.

We made a complete investigation of the various motorized vertical filing units available, preparing an analysis sheet to compare several different files on capacity, cost per file and per filing inch, floor space requirements, speed of random access to individual records, posting facilities, etc.

The system* that was selected as the result of this study consists of three units, which provide capacity for present volume plus projected expansion. They occupy only 54 sq ft of floor space, which represents a 46% saving. Operators remain seated and touch a button to bring any desired record to their finger-tips within a few seconds. Telephones attached to the units enable operators to answer telephone inquiries without leaving their chairs. Posting is accomplished on a convenient work

*Motorized Diebold Super Elevator Files.

Mr. Ringelstein is supervisor of customer credit at Rochester Gas.

GAS exclusive

shelf extending the full width of the unit. Posting is speeded because each operator is able to position media and record to suit her writing habits. The end-result we wanted—maximum workability with minimum time and effort—has been achieved.

In making the change, we were faced with the problem of transforming more than 150,000 folded visible records, with the name on the bottom edge, to vertical cards with name on top edge. A thorough analysis disclosed that, for 95% or more of our accounts, all entries on the 6-in. by 7-in. visible record cards could have been accommodated on a single 6-in. by 4-in. card. We decided to adopt the smaller card for all accounts, using two cards for the few accounts that need more posting area.

A new 6-in. by 4-in. card with the name on the top edge was designed for use in the super elevator files. An interim supply of these cards was prepared with spaces for name on both top and bottom edges. This interim card enabled us to add accounts in the old files in a manner that would permit direct transfer when we were ready to put the new files in operation.

First step

Our first plan for preparing the visible records for transfer to the vertical files called for folding the bottom edge and gluing it to show the name at the top of the reverse side of the card. While not regarded as an ideal solution, it appeared to be a satisfactory expedient for a temporary period until we could transcribe records to the new cards. The old cards could be mechanically refolded and glued at the rate of 8000 per day. This quantity, representing about 5% of our total records which would be unavailable each day, appeared to be acceptable.

By touching a button, the operator may bring any desired record forward within a few seconds. Note phone attachment.

One at a time

Though several methods for carrying out the equipment transfer were studied, it was decided to place one super elevator file at a time in the department. Succeeding units were placed in use after the preceding unit was filled and the old, emptied files removed. While comparatively slow, this procedure caused minimum disruption of regular daily work, was easily accommodated in the limited space available, and required no additional clerical help.

Immediately after the first new file was received, card conversion was started. The refolding and gluing procedure soon hit a mechanical snag and we were compelled to develop a new method of transforming old cards for transfer to the new files.

Further analysis disclosed that the 3-in. by 6-in. fold in the old card could be cut off from approximately 90% of the records without loss of essential credit information. For the remaining 10% of the records the necessary credit information on the fold could be transcribed to the 6-in. by 4-in. portion of the card. For transferring name and Soundex code from the bottom to the top of card we used sheets of partially transparent, perforated gummed paper. The names and codes were typed to these sheets and then pasted on the top margins of the cards. The thin gummed paper caused only a small filing buildup and minimum loss of filing space. This procedure offered the advantage of requiring removal of no more than one-half of 1% of the cards from the files at any one time. We used this method to complete the transfer on schedule without upsetting our employees or sacrificing current credit control.

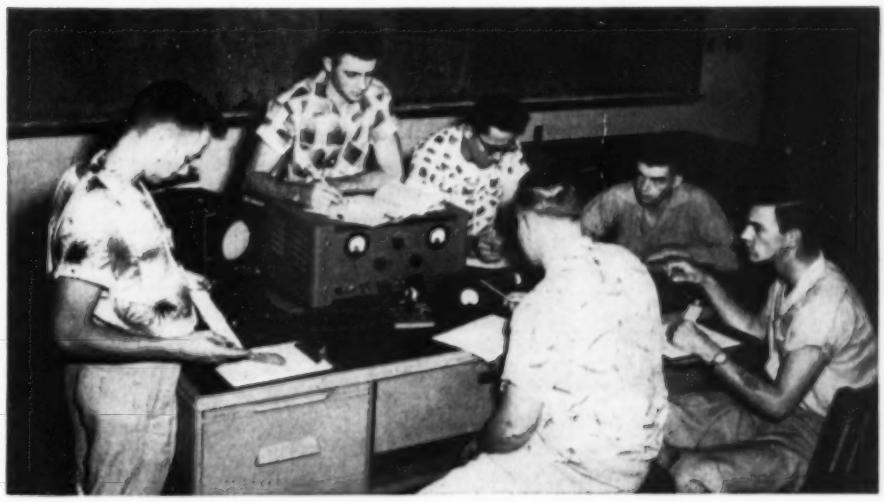
Floor space released

Instead of needing more space for an increasing volume of records the credit department has been able to release 342 sq ft of floor space for other use, showing a saving of 45%. Three operators and one supervisor now handle all activity, including projected expansion. More than 3800 operations and more than 4000 ft of walking a day have been eliminated.

In addition to these cost-reducing factors, working conditions have been greatly improved. Each operator now enjoys a separate, modern and comfortable working position. Physical effort has been reduced. Lighting and ventilation are materially better. The practical convenience of motorized super elevator files has enabled us to achieve our goal of doing a better job less expensively.

The three units in use provide capacity for present volume plus projected expansion.

Almost 20 years ago gasmen chose Texas A&I as the site of a much needed course in gas engineering. Now, in addition to technical training, Texas A&I, through the SGA management development program, teaches mid-management personnel to do a better job.



Laboratory study of communications at Texas A&I.

Courses of study at Texas A&I expand with the gas industry

By FRANK H. DOTTERWEICH, Director, Division of Engineering
Texas College of Arts & Industries, Kingsville

A COURSE in natural gas engineering was included in the offerings of Texas College of Arts and Industries for the first time in September 1935. The need of specialized training in this field was recognized by a group of men in the natural gas industry who set up a curriculum for the course and selected Texas A & I College for its presentation.

The educational program has kept pace with the phenomenal growth of the industry for which it trains men so that it now includes (1) undergraduate work toward the Bachelor of Science degree, (2) graduate work toward the Master of Science degree, (3) sponsored research work, (4) the Southern Gas Association short course in gas technology, and (5) the Southern Gas Association's management development program.

Frank C. Smith, president of the Houston Natural Gas Corp., has been active in the development of this program since its introduction. Men who worked closely with Mr. Smith throughout the years have been Chester L. May, vice president, Lone Star Gas Co., and N. C. McGowen, president, United Gas Corp. As the course developed others who have been active are John F. Lynch, president, La Gloria Oil & Gas Co.; Fred Fues, vice president, The Chicago Corp.; Gardiner Symonds, president, Tennessee Gas Transmission Co.; and Robert E. Suttle, managing director of the Southern Gas Association.

In 1946 the need was seen for a short course in gas technology. At that time the first course was given under the sponsorship of the Southern Gas Association at Texas College of Arts and Industries. This course is now in its 10th successful year of presentation. Mr. Suttle and others of the Southern Gas Association group have not only given of their time and help to the short course in gas technology but have also seen the need of a management development program for the natural gas industry. The SGA management development program designed especially for the transmission and distribution groups of the natural gas industry was initially presented in August 1954. Mr. Suttle organized and leads a special industry committee through which the natural gas companies of the Southwest have made available to the college a complete all-year absorption air conditioning unit to be used for research study and to air condition the new

TABLE 1. NUMBER OF GRADUATES

Year	Graduates
1938	9
1939	13
1940	12
1941	17
1942	9
1943	7
1944	3
1945	—
1946	2
1947	8
1948	16
1949	16
1950	35
1951	37
1952	15
1953	15
1954	11
Total	225

GAS exclusive

Curtis Smith, chairman of the SGA management development committee, presents course content book to C. R. Fussell of El Paso Natural. Frank Dotterweich, director of the course, looks on.

$250,000 engineering building.

The selection of Texas A. & I. College for the natural gas program proved to be a location in the midst of the second largest natural gas field and one of the largest gas condensate fields in the country and with a high pressure gas condensate well on the campus. This location is unmatched for laboratory field studies. The campus is sufficiently removed from distracting influences of a large city to allow for quiet surroundings favorable to effective study. Conveniences and recreational facilities are available for relaxation in a pleasant environment with a mild climate throughout the year.

The Bachelor's degree in petroleum and natural gas engineering requires the completion of 157 credit hours, taken over a period of 4½ years. The student may parallel this work and obtain a reserve officer's commission through the Reserve Officers' Training Corps of the college, activated in the fall of 1951.

A total of 225 graduates, as shown in *Table 1*, have selected this work and obtained their degrees in petroleum and natural gas engineering.

These graduates have found employment throughout the United States and South America, being distributed equally in the employ of gas utilities, gas production companies and the chemical industry.

The graduate program, with a Master's degree in engineering in the field of natural gas engineering, was initiated in September 1951. The projects in *Table 2* have been completed and published as graduate thesis work.

As the graduate work develops it will be limited to an active registration of about 10 graduate students, the present capacity of the division of engineering for advanced study. This method of industrial research offers the natural gas industry an excellent opportunity whereby its technical problems may be solved in the laboratory adjacent to gas production fields.

Faculty and courses consist of:

1. Frank H. Dotterweich, B.E., Ph.D., professor and director, lecturer in chemical engineering, natural gas processes, combustion engineering.

2. C. V. Mooney, B.S., M.E., associate professor, lecturer in petroleum and natural gas engineering, condensate and natural gas production, distribution and transmission, gas measurement and air conditioning.

3. Emerson Korges, B.S., M.S., associate professor, lecturer in thermodynamics and heat engines.

4. Robert M. Adams, B.S., M.S., assistant professor, lecturer in engineering drawing and descriptive geometry.

5. Marcus M. Truitt, B.S., M.S., assistant professor, lecturer in physical and historical geology, stratigraphic and structural geology and fluid mechanics.

6. John R. Guinn, B.S., M.S., assistant professor, lecturer in elements of electrical engineering and dynamics.

7. Paul Treptow, B.S., M.S., instructor, lecturer in statics and strength of materials.

8. Ben P. Bailey, B.S., M.S., associate professor, lecturer in surveying.

The short course in gas technology offered by the college and sponsored by the Southern Gas Association continues to be a popular means whereby gas engineers of the South assemble yearly to refresh themselves on recent developments in the production, conditioning and transmission of natural gas. Enrollment in the course is limited to about 200 representatives of SGA-member companies. The 10th annual short course in gas technology will be held at Texas A. & I. the first week of June 1955. An administrative committee with guidance from an advisory committee selects subjects of current national importance to be presented and obtains outstanding speakers for each subject chosen.

Leading experts in the field of production, conditioning, and transmission of natural gas conduct classes throughout the three-day meeting, and in addition, inspection trips are arranged to the variety of industrial plants in the area. Other features include an inspection trip to the famed King ranch and a Texas-style barbecue at the Humble camp on the ranch. A bound volume of the papers delivered records the yearly presentations.

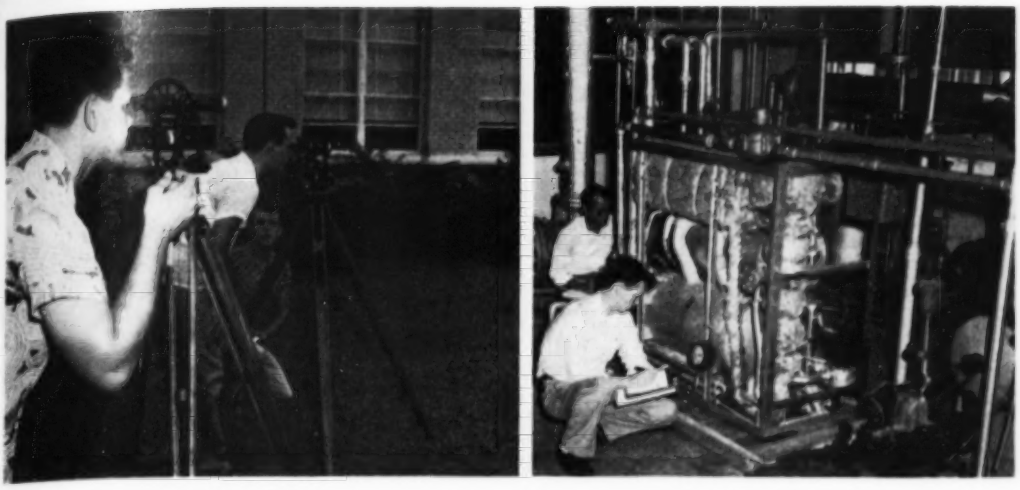
The administrative committee for the 1954 course was composed of H. F. Steen, El Paso Natural Gas Co.; R. C. Granberry Jr., Humble Oil & Refining Co.; Homer C. Givens, La Gloria Oil & Gas Co.; Paul L. Hughen, Texas Eastern Transmission Corp.; Roy Schuster, The Chicago Corp.; Raymond Crowe, Transcontinental Gas Pipe Line Corp.; and R. R. Suttle, managing director, SGA.

The advisory committee included W. C. McGee Jr. (chairman), Tennessee Gas Transmission Co.; L. C. Poindexter, United Gas Pipe Line Co.; M. K. Sanders, Trunk Line Gas Co.; C. L. Perkins, El Paso Natural; Frank C. Smith, Houston Natural Gas Corp.; Clyde McGraw, Transcontinental; John F. Lynch, La Gloria Oil; Fred Fues, The Chicago Corp.; James Clement, King ranch; Oliver N. Clark, Southern Natural Gas Co.; Eli Cunningham, Texas Eastern Transmission Corp.; Thomas S. Bacon, Lone Star Gas Co.; James E. Pew, Sun Oil Co.; Al Bristow, Northern Natural Gas Co.; Hudson D. Carmouche, Houston Pipe Line Co.

The SGA management development

TABLE 2. GRADUATE THESIS PROJECTS

1. Pilot plant study of the adsorptive properties of soils for natural gas odorants.
2. Laboratory study of the adsorptive properties of soils for natural gas odorants.
3. Research on the installation and operating characteristics of absorption air conditioning equipment.
4. A study of the subsurface water resources of the lower Gulf Coast region.
5. An economic study of the distribution of natural gas in various locations in Mexico.
6. The use of natural gas as fuel for heating to prevent damage to citrus orchards by frost and freezing.
7. Maintenance problems in cooling tower operations in southeast Texas.



Left: Running the line at AGI. **Right:** Laboratory study of an absorption refrigeration unit.

program offers to its gas company members a means of training middle-management personnel to do a better job in their respective positions. The course as designed trains individuals to become better managers by giving them a broader understanding of the fundamentals of management in the natural gas industry. Realizing the importance of this program to the industry and the many problems to be solved in its development and presentation, especially during the first year, SGA selected a committee of top management men to plan, design and supervise the first course which was held during the first two weeks in August 1954.

The committee consisted of Curtis M. Smith (chairman), vice president of Tennessee Gas; Kenneth Fellows, secretary, Houston Natural; Ray A. Metzke, division manager, United Gas Corp.; H. N. Oldham, vice president, Southern Union Gas Co.; Tom Sterling, vice president, Oklahoma Natural Gas Co.; R. R. Suttle; and Don W. Weir, personnel manager, Arkansas-Louisiana Gas Co.

The following curriculum was developed by the committee:

A. Gas industry economics
   1. Private versus public ownership of gas utilities
   2. Regulation and legislation
      a. Local and state
      b. Federal
   3. Finance

B. Records and reports
   1. Necessity and importance of good records and reports
   2. Understanding the use of records and reports
      a. Budgetary control

C. Load building
   1. Gas versus electricity
   2. Sales promotion

D. Essentials of administration
   1. Fundamentals of management
      a. Leadership principles
      b. Functions of organization
      c. Planning and organization of work
      d. Communications
      Policies and procedures
   2. Employee relations
      a. Human relations
      b. Training and safety
   3. Public relations
      a. Customer relations
      b. Civic and community activities

The course was so designed that a minimum of time was required away from the job. Mid-week trips, educational in nature, were made to the King ranch and the plant of Celanese Corp. of America at Bishop, Texas. During the weekend between the two weeks of study, a two-day trip was taken to inspect natural gas production, processing, transmission and utilization installations throughout the Rio Grande Valley.

Attending the first SGA Management Development Program were 29 men, representative of 20 companies from 10 states. Of this total, 17 and 12 were from the transmission and distribution sections respectively.

Texas College of Arts and Industries will continue to play its role in natural gas education by expanding its curriculum to meet the changing demands of the natural gas industry.

RESEARCH PROJECTS FOR 1954

(1) **Air conditioning refrigeration** — Studies are being conducted toward the design and development of refrigeration units. Present laboratory tests include test runs on an absorption refrigeration unit of 20-ton capacity. Other types of gas refrigeration units are in the stage of design and development.

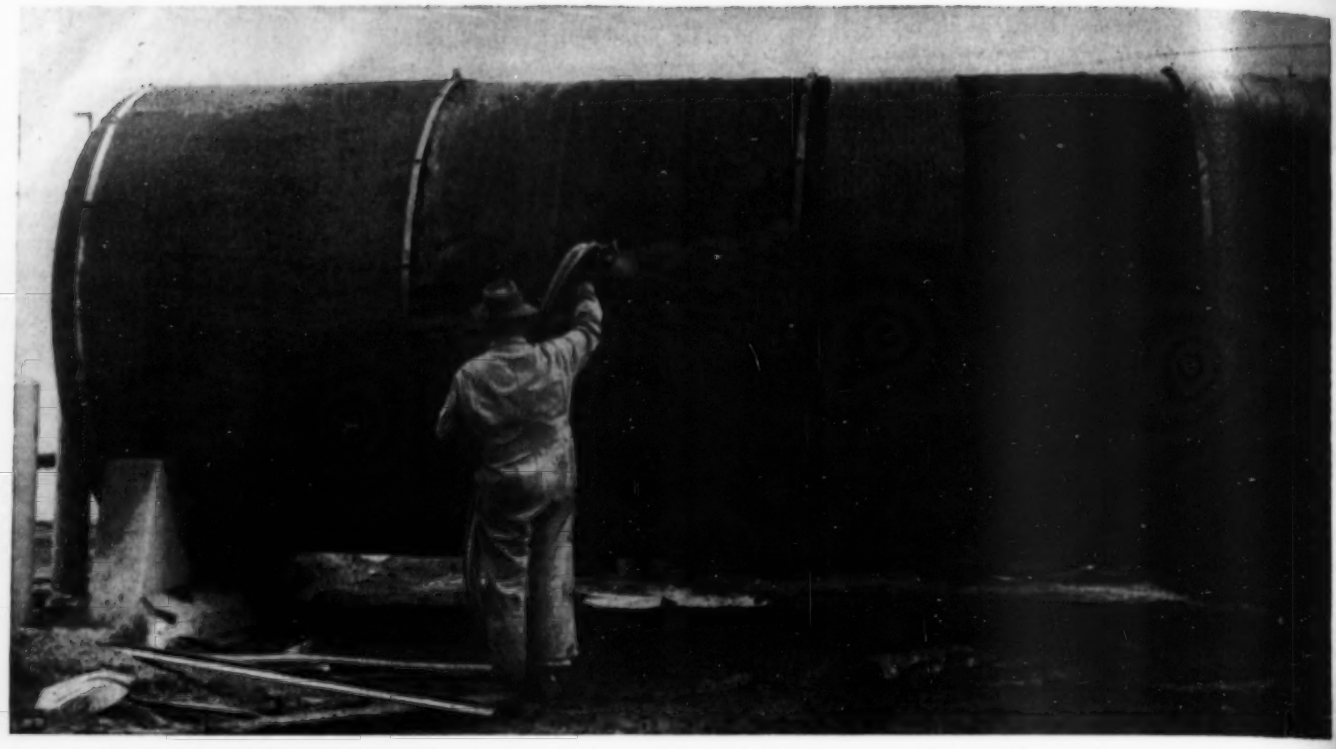
(2) **Cooling tower design and operation**—Di-thermal natural draft cooling tower operation and design is under test and development. Additional studies are being conducted on maintenance problems in cooling tower operation.

(3) **Natural gas jet compressors**—In the throttling of high pressure natural gas to pipeline pressure, useful energy is wasted. Gas jet compressors utilize the throttling energy to aspirate and boost low-pressure field gas to pipeline pressure by the use of this high-pressure motive gas. A test unit is in the field for test and development work on a dually completed gas well with high- and low-pressure natural gas.

(4) **Natural gas odorization**—A continuing program of natural gas odorant evaluation is being conducted. Room tests are used with a procedure developed at Texas College of Arts and Industries to evaluate various commercial gas odorants.

(5) **A study of the subsurface water reserve of the lower Gulf Coast region**—In many locations of this area, the limiting factor of industrial gas expansion is the availability of water. This work has made available the amount of subsurface water being withdrawn in the Kingsville-Bishop area and the rate at which it is being replaced. This work is being continued to include storage of surface water in subsurface sands by injection-well operations. Also a qualitative analysis of the water through the sand is now in progress.

(6) **Aluminum-copper connector research**—Studies are being conducted on the performance of various types of connectors involving aluminum and copper material under varied conditions of current and outdoor exposure.



Workman at Minneapolis Gas Co. guns on first coat of vermiculite concrete. Rebound is caught on a canvas drop and used again. Metal lath has been applied to the butane tank.

Air-placed vermiculite concrete fireproofs standby equipment

FOLLOWING a test with a pilot model tank in one of its furnaces, Minneapolis Gas Co. has treated a large butane tank with a new and practical type of fireproofing—a 2½-in. thickness of air-placed vermiculite concrete.

The earlier test showed that this material can provide protection well within the limit of insurance requirements for LPG tank fireproofing, i.e., that the temperature of the metal not in contact with the liquid LPG shall not exceed 800° F after two hours' exposure to an ambient temperature of 1800° F.

The steel test tank, 5 ft long with ¼-in. wall thickness, was encased in 2¼ to 2¾ in. of air-placed vermiculite concrete reinforced with hexagonal wire mesh, and the concrete was allowed to cure for 30 days before it was tested. Thermocouple readings showed that the highest recorded temperature beneath the fireproofing at the steel surface of the tank did not exceed 237° F after two hours in an average furnace temperature of 1890° F. A span of four hours and 20 minutes was required to raise the temperature of the steel to 700° F.

GAS exclusive

Durability

The new fireproofing material is also durable. After the test tank had cooled, the encasing jacket was cut lengthwise into three sections. All three were rigid enough to withstand rough shaking while suspended at both ends, and it was estimated that the concrete had retained 75% of its original structural strength.

Speedy application is a third advantage of this treatment. Vermiculite concrete is sprayed onto the tank in a gunning operation. One part Portland cement and 12 parts No. 0 vermiculite aggregate are mixed and placed in a hopper, from which they are conveyed by compressed air through the hose to the nozzle head of the gun. As the dry material reaches the nozzle, it mixes with water and emerges as a spray. An average of 300 sq ft per hour can be covered with a 1½-in. thickness by one machine.

The amount of water mixed with the dry material depends on the type of surface to be covered and whether fresh or rebound material is being applied. Unlike sand concrete rebound, which must usually be discarded, vermiculite concrete rebound can be used again.

Additional advantages

Two additional advantages of vermiculite concrete are its high insulating quality and its adherence to painted metal surfaces, expanded metal laths, and hexagonal mesh netting.

The full-scale butane tank treated by Minneapolis Gas was 9 ft in diameter and 53 ft long, with a capacity of 24,000 gal. The tank lay horizontally with a concrete support at each end and was from 1½ to 2 ft off the ground.

Before it was treated, the tank was thoroughly de-rusted, then painted

with metal primer and aluminum paint. An extra coat of water-resistant, grease-type paint was added. Expanded metal lath was applied over the entire surface. To assure uniform thickness of the concrete, four screens made of 2- x 4-in. steel bands were fastened around the tank. These were moved along as the concrete was gunned.

First application

The first coat of vermiculite was blown on 1 in. thick. As soon as a section had been finished, it was screened. When the entire tank had been covered with the first coat, hexagonal wire mesh was bound tightly over the concrete and a second coat of vermiculite blown on to a thickness of 1½ in.

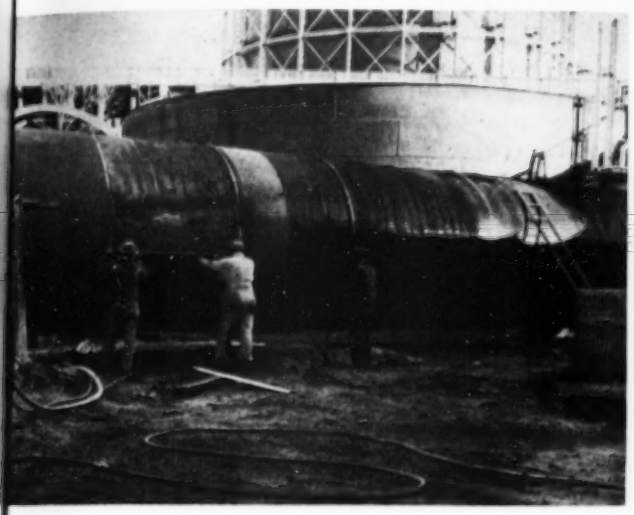
As weatherproofing, a final ½-in. coat of structural concrete was gunned to the under side of the tank and half way up the sides. This was feather-edged into the vermiculite concrete. The entire tank could have been so weatherproofed, but Minneapolis Gas decided to apply a metal hood of corrugated steel over the upper half.

Small holes were bored along the bottom of the tank through the total thickness of the fireproofing jacket to act as breathing vents and provide escape for any moisture that might condense on the tank.

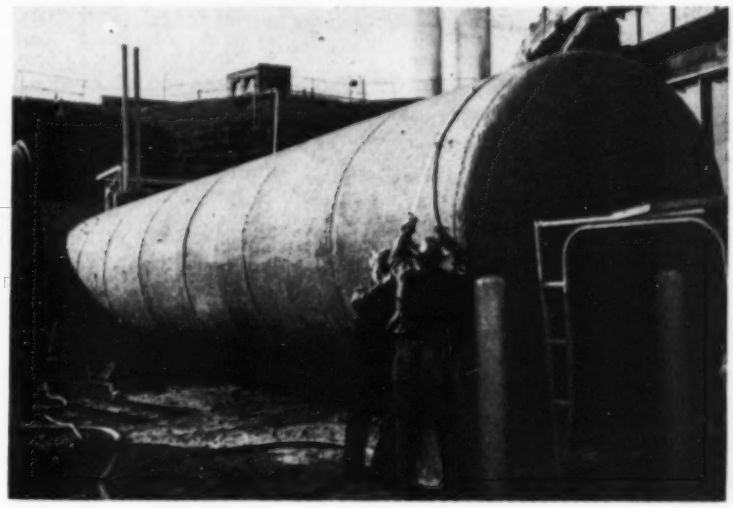
A good insulation factor in fireproofing material can keep temperature inside a tank constant and prevent gas from escaping through pop-off valves. On a hot day, and with a tank that does not have fireproofing, "wild" ethane gas present can develop a higher vapor pressure and cause the valves to pop. The escaping vapors can settle down or travel in layers over a point of ignition if the wind is right.

Temperature increases

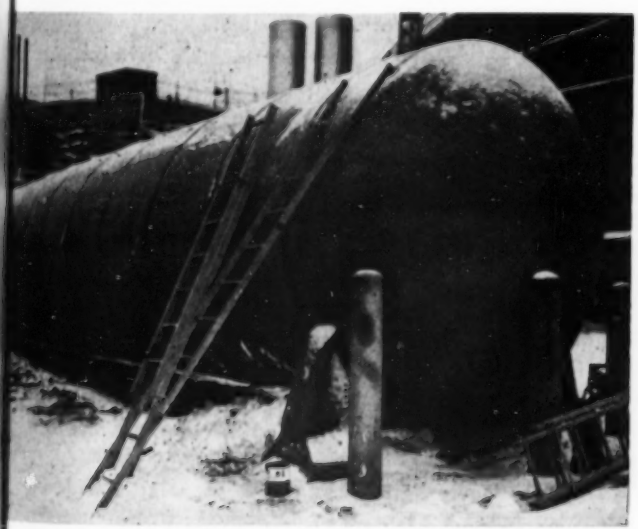
At Minneapolis Gas, readings taken during the summer showed that temperature increases of untreated tanks in locations comparable to the treated tank averaged about 2° F from 10 a.m. to 2 p.m., while the temperature increase of the tank treated with vermiculite concrete averaged less than .3° F.



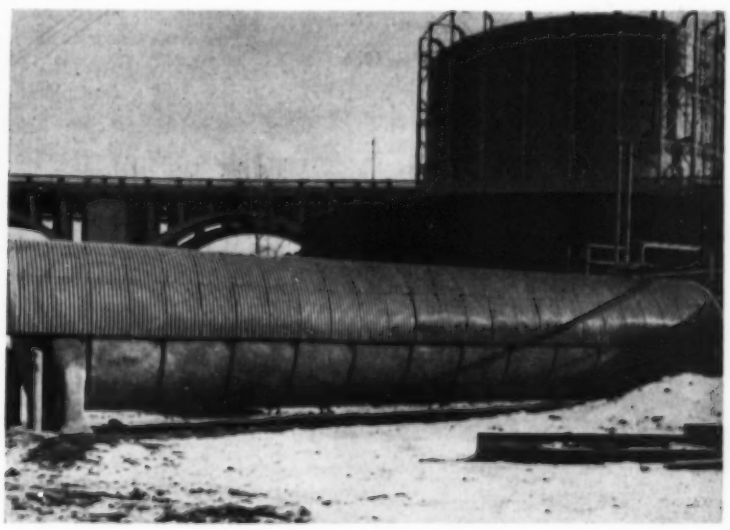
To assure uniform thickness of the concrete, four screeds made of 2- by 4-in. steel bands were fastened around the tank. Men are screeding a section of the tank with a straight edge.



Men place screeds for the second coat of vermiculite concrete fireproofing. Hexagonal mesh has been tightly bound over the first coat of concrete. Second coat is gunned on in the same manner as the first.



After application of vermiculite concrete was completed, sand concrete weatherproofing was applied to the lower half of the tank. Steel straps for securing the metal housing were then applied.



Completed tank, with a corrugated steel sheet cover. The ends are framed in a half-round box. Small holes were bored along the bottom of the tank through the fireproofing jacket to act as breathing vents.

GAS staff report

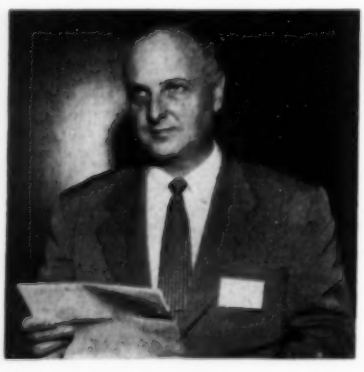
Kuykendall cites "commission discretion" as a ray of hope for gas producers

By **WILLIAM W. CLARK** • Editorial Director

ON NOV. 9, Federal Power Commission Chairman Jerome K. Kuykendall, speaking before the American Petroleum Institute's 34th annual meeting in Chicago, enunciated the commission's much-disputed policies in connection with the famous "Rule 174-A" imposing commission regulation at the wellhead. Said Chairman Kuykendall:

"Independent producers of natural gas are now subject to regulation by the Federal Power Commission not by the whim of the commission but by virtue of an act of Congress, as that act has been construed by the Supreme Court of the United States. . . . In this situation, the particular ideologies of any member of the commission must, if they are not in harmony with the law, give way to the law. . . .

"However, in many situations there is considerable room within the law for the exercise of discretion, and it is in this realm that the commission is endeavoring to do what it can to simplify, improve and change the techniques previously employed in its traditional type of regulatory work, to meet the wholly different problems now presented."



"There is considerable room within the law for the exercise of discretion," Chairman Kuykendall told the API.

In what direction might this "commission discretion" be exercised?

New rate policy

"The commission recognizes that the characteristics of the gas producing industry are quite different from those of the gas transmission industry. In April of this year, before the Phillips decision was rendered, a majority of the commission refused to follow the previously held policy of fixing the allowed price of gas produced by a pipeline company solely on the basis of cost, and allowed instead the weighted average field price. This was done with full knowledge of the pendency of the Phillips Petroleum case.

"Prior to the Phillips decision in June, the law was (as I understand the Supreme Court's decision) that the commission *could, but was not required to* fix the price of gas produced by a pipeline company by use of the traditional rate base method. This was the purport of the court's decision in *FPC v Hope Natural Gas Co.* 320 U. S. 591 (1944), where four justices were of the opinion that the commission *had no power to fix the allowed price* of gas produced by Hope Natural Gas Co., an interstate pipeline company, on the basis of cost; one justice would *not* hold that the commission could *not* do so, although he thought it very unwise; and the other four held the commission could lawfully do as it had done. All members of the court recognized that the commission could do differently if it wished but that decision should rest with the commission.

"Although the Phillips decision has greatly enlarged our responsibilities by requiring us to regulate the price of gas sold in interstate commerce by independent producers, it does not confine the commission to the use of the rate base method of valuing natural gas which the court permitted in the Hope case.

"The commission realizes that the business of exploring for and developing natural gas reserves entails many risks, and that the financial rewards must be commensurate with those risks, if exploration, drilling, and production are to continue. We intend to recognize this indisputable fact in our rate making, no matter what methods may be employed in testing the reasonableness of producers' rates."

Producers not soothed

Mr. Kuykendall's cautious remarks, while they found general favor and agreement among the majority of his listeners who recognize the sticky position the commission has been placed in by the Supreme Court's decision, nonetheless failed to silence the anguished cries of the producers both at the convention and elsewhere.

Nor were there any definitive developments in the struggle of producers to run for cover through their escape clause hatches, in spite of a mass of newsmaking developments.

Resort was had to the courts in three

instances, but as of mid-November the tide appeared still to be running against the gasmen. On Nov. 15 in Houston, Federal District Judge Ben C. Connally ruled no jurisdiction in Magnolia Petroleum Co.'s plea for a declaratory judgment to determine its rights to cancel a contract for gas sales from the La Gloria field. A request for a temporary injunction to prevent Texas Illinois Natural Gas Co. from prosecuting a complaint before FPC, wherein the latter company seeks a ban on La Gloria producers' invoking their escape clauses, similarly failed. Magnolia's suit, filed in September, was a test of the validity of escape clauses, which conflict with Rule 174-A.

Ruling on validity of law

Judge Connally ruled that the request for a declaratory judgment was "no more or less than an attempt to secure from this court a ruling on the validity of FPC Orders 174 and 174A under the guise of a judgment declaring the rights of the parties under the contract." He couldn't agree with Magnolia's contention that the FPC orders are void and that the case could be decided on that basis. Since the orders are under review by the commission, Magnolia will have to wait for the commission ruling and then seek judicial relief through channels provided.

However, the court ruled that an argument between Magnolia and Texas Illinois over amounts to be recycled was a matter for its jurisdiction, to which Magnolia's attorneys took exception on the basis of inconsistency.

Other court appearances involved Stanolind, which filed suit in the federal district court for the northern district of Oklahoma seeking interlocutory and permanent injunctions to prevent FPC from enforcing Order 174-A against the company, and Ohio Oil Co., which carried its plea for a review and stay of the order to the fifth circuit court of appeals in New Orleans. In four counts, Stanolind alleged the order exceeds FPC authority requiring certificates of convenience and necessity, deprives Stanolind of its property without due process, imposes duties of a public utility or common carrier, and violates the fifth amendment by confiscating property for public use without just compensation.

Stanolind's maneuver was termed "unusual" in that the suit was brought against the government rather than FPC. In the Oklahoma court, such a move is possible, while under that jurisdiction the action could not have been brought against the commission.

The Kuykendall promise to API that FPC would open its ears to suggestions by producers as well as other interested parties are being carried out in Docket R-137, on which hearings opened Nov. 4 before the commission, sitting en banc. In this docket, FPC is considering rule changes covering escalation and "favored nation" clauses which would bar certification of projects based on supplier contracts containing such clauses. One proposed rule would declare such contracts "not to be acceptable as evidence of gas supply."

In the hearings, Wisconsin Public Service Commission, probably the leading proponent of producer regulation, the Colorado Municipal League, Philadelphia Electric Co., and Minneapolis Gas lined up together in support of the rulings, while Columbia Gas System, Tennessee Gas, and El Paso Natural generally were in agreement with the producers' position. Columbia's cautious argument was for an indirect application of incentives to encourage developments of production, while El Paso openly sided with the producers. El Paso based its argument on the necessity of having long-term purchase contracts, which escalator clauses make possible. Favored nation clauses are also needed to induce suppliers to enter into such contracts, El Paso held.

In San Francisco, meanwhile, El Paso's president, Paul Kayser, speaking before the California Manufacturers Association, warned that continued federal control of producers would imperil state conservation practices. Mr. Kayser cited the recent action of the City of Chicago in asking FPC to compel producers in the La Gloria field in Texas to sell gas to Texas Illinois for delivery to Chicago rather than to recycle it. He made a direct request for consumer support of any Congressional action that might be taken at the next session.

Such action has already been promised by Sen. Price Daniel of Texas. His bill will be patterned after the Kerr bill, which lost out by a Truman veto in 1950. The new faces in Congress, incidentally, are not generally expected to swing the tide either way, and a close battle is predicted.

FPC's refusal to suspend proposed rate increases of 238 producers, thereby allowing the increases to become effective Nov. 1, is also likely to have Congressional repercussions. Pundits did not have a ready explanation for the move, which appeared to be further complicated by the fact that FPC did suspend five others involving $2.9 million in annual charges. But Senator Kefauver of Tennessee, a member of the Senate anti-monopoly subcommittee, promptly labeled the decision a "further breakdown of regulation devised to control an essentially monopolistic industry, the field producers of oil and gas." Echoing the fears of other consuming-state solons, the Tennessee senator predicted jumping gas rates and proposed an investigation by the subcommittee.

State conservation practices are in peril if the federal control of producers continues, warned El Paso's Paul Kayser.

Conservation fight

The threatened clash between federal and state regulatory interests in the area of conservation appeared to be coming to a boil in the Supreme Court, where a decision to rule on whether Oklahoma has the right to regulate wellhead prices was announced Nov. 7. The court's own edict in the Phillips case injects a new element in this controversy, which has raged for several years since the first wellhead price floor was laid. Natural Gas Pipeline Co. of America is appealing a recent Oklahoma supreme court decision upholding a state conservation commission order raising the wellhead minimum from 7 cents to 9.8262. Panhandle Eastern and Michigan-Wisconsin are also appealing the order.

In its brief, Natural Gas declared the state order is "in direct conflict" with the Supreme Court's decision (in the Phillips case) that "state regulation inconsistent therewith must fall."

Back in the FPC chambers, hearing

Utilities join to stage roadshow boosting ranges

BROADWAY stage stars shared top billing with 14 major brands of gas ranges in a road show recently played before capacity dealer audiences in five cities of eastern Ohio and western Pennsylvania.

The entire sales promotional production was sponsored by four gas utilities —the Pittsburgh Group companies of Columbia Gas System, the Peoples Natural Gas Co. and Equitable Gas Co., in cooperation with the East Ohio Gas Co. of Cleveland.

The gas promotional activity featured a play entitled "Proof of the Pudding,' which included skits and demonstrations highlighting the features of modern gas ranges, and the advantages of gas over competitive types of heat.

It is believed that this is the first time a professional promotional activity was sponsored cooperatively throughout a marketing region by gas utilities rendering a natural gas service to 1.5 million Ohio and Pennsylvania homes.

The show, kick-off in a six-weeks' consumer sales campaign on Matchless gas ranges, was designed to acquaint gas range dealers and their sales personnel, particularly those new on the job, with gas and gas range selling points.

In the play, gas and gas range qualities are presented by housewives incensed by the lack of practical sales and product knowledge of an appliance salesman. In no uncertain terms, he is told that gas ranges are of the most modern design, adaptable to every type of kitchen, that they are fully automatic and provide safe and sure cooking, that they are economical in purchase price, installation, maintenance, and cost of operation.

"They're perfect," agree cast members referring to the 14 gas ranges displayed on stage.

Near the end of the play the harrassed salesman admits that he had been taking the course of least resistance in guiding the customer to another type of range. Demonstrating his complete repentance, he joins the housewives in proving gas ranges and gas heat superior on every score to other type ranges.

Sharing the stage with the professional actors are the co-stars, the latest model Matchless gas ranges. A staff of cooks served audiences a full course dinner at the conclusion of the show. Some of the items on the menu were prepared in the model gas ranges, before the eyes of the audience, while the play progressed. This was the final "proof" offered by the four utilities of gas cooking superiority, and was the basis of the title of the play.

The production was staged for more than 3000 dealers and appliance sales personnel in Cleveland, Pittsburgh, Akron, Canton, and Youngstown.

The four gas companies believe the show was a vital initial step in this year's Matchless range promotion, which began Oct. 4.

Backers of the show and cast members gather backstage. From left: A. W. Conover and C. H. Mullholland, Equitable; Jack Albertson, lead in show; Charles Yost, Peoples Natural; Norval Jennings, AGA; Roger Forster, play narrator; and Robert Lowe, Manufacturers Light.

was set to start Nov. 29 on the question of whether Deep South Oil Co. is a natural gas company. Deep South, which is seeking a declaratory order, is an oil company with some incidental gas production which it sells to Texas Gas Corp. at the wellhead. Texas Gas gathers Deep South's gas, commingles it with that of other producers, strips it, and sells the residue both interstate and intrastate. Deep South says the interstate sales have been made without its knowledge or consent.

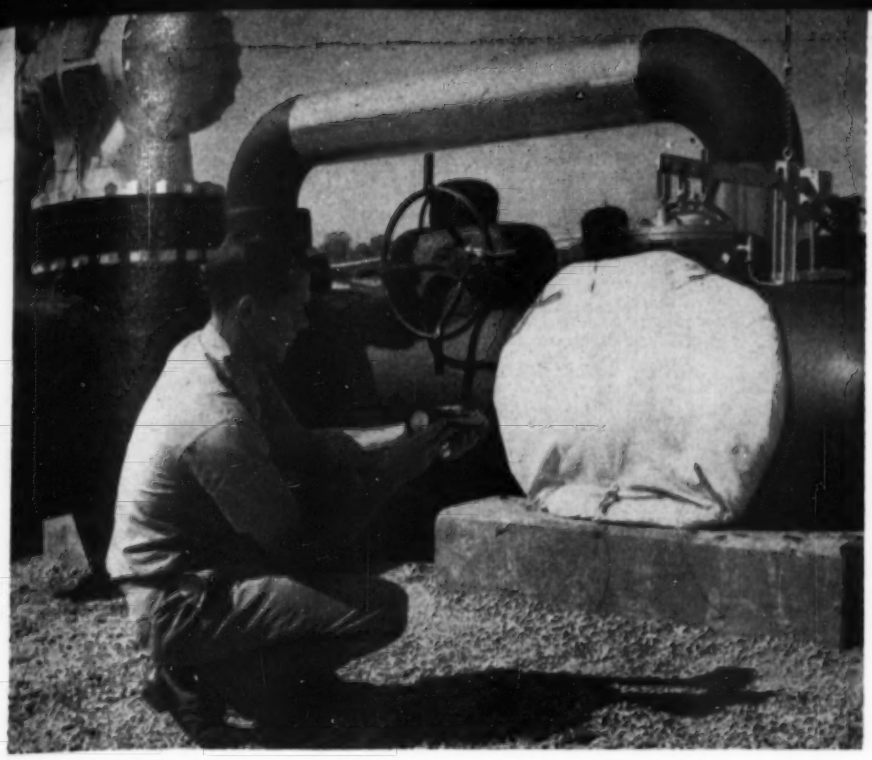
While at the API convention, speakers were generally leveling the main artillery at the Supreme Court decision rather than FPC, the Texas Independent Producers & Royalty Owners Association was charging that FPC was exceeding the mandate of the court. In a strongly worded letter to Arthur S. Flemming, chairman of the Cabinet Committee on Energy Supplies and Resources Policy, President Jack Woodward declared:

"The Federal Power Commission appears increasingly disposed to go beyond both the Natural Gas Act and the unwarranted interpretation of the act by the Supreme Court in the Phillips case. Its Order 174-A is but one extreme example, inasmuch as it extended FPC jurisdiction well beyond anything even indicated by the Supreme Court mandate.

"Now comes a series of new FPC policies going still further beyond authority vested in the commission. Among them is (a) the apparent assertion of jurisdiction over actual facilities of natural gas producers and gatherers selling to interstate pipelines, (b) an attempt to compel independent producers to commence sales to a pipeline company simply to prevent 'collapse' of a project to supply a 'large unsatisfied demand for natural gas' in an area, and (c) effective denial of escalation and favored nation provisions of private contracts after having previously approved such contracts in effect.

"Not only has the commmission sought to freeze the supply independent producers are delivering to interstate lines at present levels and prices, but it is actually attempting to induce independent producers not now connected to supply certain pipelines."

For additional news on how FPC Rule 174A is affecting various segments of the industry, see Pipeline News Section, beginning on page 116.



Use of sound level meter provides accurate measurement of progress in soundproofing.

A whistlelike noise is created at pressure-reducing stations when high gas pressures are cut to low, thereby increasing the velocity. This noise can be, literally, a headache. But it needn't be. Here the author tells how sound was reduced at five United Gas stations in Texas.

Experiments in sound abatement

By **C. A. SERAFINO** • United Gas Pipe Line Co., Dallas

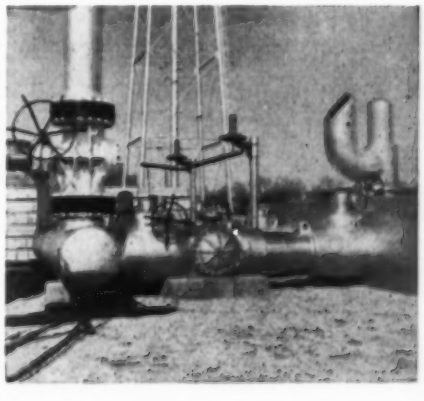
IN 1927 the main measuring and regulating station in Houston (since removed) reduced gas pressure from 150 psi to a variable outlet, measuring pressure of 15 to 40 psi. The station was housed in a stucco and brick building, with its floor line 4 ft below the normal outside ground line. The measuring station consisted of three 10-in. orifice meter tubes and two 10-in. regulators. Noise from these regulators (loudest when the load was least) could be heard three to five blocks away. To abate the sound, walls and ceiling of the station were lined with two 1-in. layers of sound absorbing board.

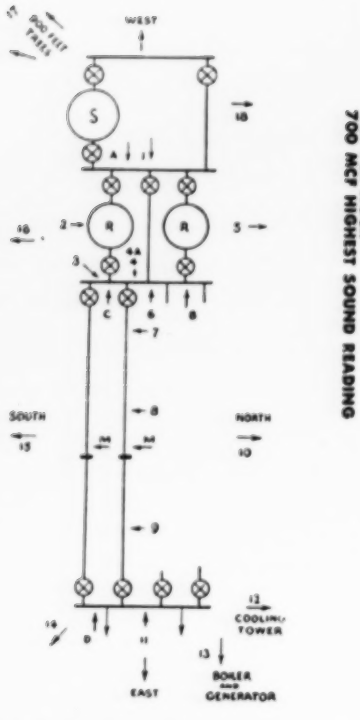
The second sound-reducing job was on a regulator—located not far from an office building and several company homes—which had been disturbing employees and their families for 10 years. The station consisted of four 10-in. tubes with a 6-in. regulator at the downstream end of one of the tubes. This was the only tube in use. The upstream tubes were buried underground at pipeline depth. The orifice flanges were accessible from a narrow pit and the downstream header (16-in.) connecting the four 10-in. tubes was in an open concrete pit. This open pit also contained the downstream 10 ft of the four tubes connecting the 16-in. header.

A square wood frame was built around the 16-in. header, leaving about 8 in. of space between the pipe and wood framework. The framework was covered with 1-in. sound-absorbing board and an outer layer of ¼-in. plywood put over this for protection. Space between the pipe and box was filled with glass wool. Noise was reduced so that it was barely audible at 125 ft.

From a regulator station in the yard of a power plant near Fort Worth, noise was so bad that complaints were coming in from a residential section six blocks away. The station consisted of three 10-in. measuring tubes, two of which were in service. Two 8-in. regulators reduced a variable upstream pressure of 90 to 260 psi to a measuring pressure of 50 psi. Only meters, controllers, calorimeter, gravitometer, and thermometer were housed. Since this station was out in the open, it presented an extra problem of preserving its symmetry while reducing the noise. Only the headers and straight runs of pipe were insulated, leaving flanges, valves

Before sound insulation (above) of upstream header, regulators and intermediate headers. After insulation is shown below.





LOCATION OF SOUND LEVEL READINGS

SOUND LEVEL READINGS
DECIBELS

FLOW RATE 600—700—900 MCF PER HOUR
700 MCF HIGHEST SOUND READING

Location of Reading	Bare Pipe—No Flow Construction Nearby	Bare Pipe No Insulation	Complete Insulation	Complete Insulation V-Port Guides Installed
1			80	68
2		109	80	70
3	60		79	69
4	60		78	70
4A		113	77	70
5				65
6		110	77	70
7			77	70
8	58	104	78	68
9				69
10				66
11	59	98	76	70
12				67
13				67
14				66
15				64
16				65
17				51
18				66

4A RELIEF VALVE NOZZLE

Results of a sound abatement program recorded with a sound level meter.

and regulators uncovered. Insulation consisted of a layer of 15-lb asphalt saturated felt, followed by two 1-in. layers of hair felt, securely wrapped with jute twine. A heavy layer of roofing felt followed the hair felt. With a load of approximately 600 Mcf an hour, noise was reduced to a level that could be heard only 100 ft away. In 1951 a new generator increased the load to 1600 Mcf per hour, which increased the audible sound to 400 ft.

A similar situation prevailed at a station near Dallas, which consisted of two 10-in. measuring tubes. The station was completely housed in a brick building. Two 8-in. regulators reduced a variable upstream pressure of 110 to 300 psi to an outlet measuring pressure of 50 psi. Peak load was near 900 Mcf per hour.

Growth added to noise

When additional generators and a third 10-in. tube were placed in service to increase maximum load to 2000 Mcf, noise was audible and annoying to employees located 250 ft away in the power plant control room. The noise level was adequately reduced by the use of felt insulation.

The installation (in 1953) of a sound level meter at a new east Dallas measuring station eliminated the guesswork used at older reducing stations.

The new station, serving the first unit of a large power plant, consists of two 12-in. measuring tubes. Regulators are 12-in. Rockwell with reduced size valves. Headers are 20-in. Upstream pressure varies from 200 to 320 psi. Measuring pressure is 50 psi.

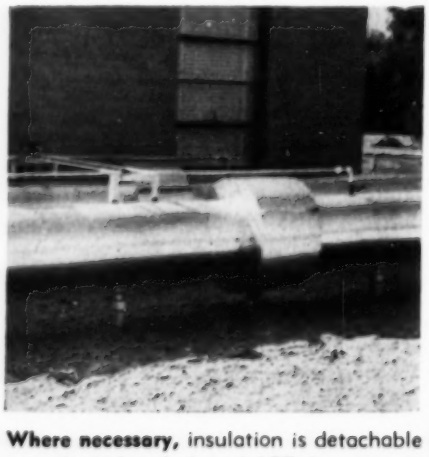
There is no housing over headers, regulators or measuring tubes; piping is above ground; meters, thermometer, controllers, telemeter, gravitometer and calorimeter are in a small building. Noise from the station was audible 2600 ft away.

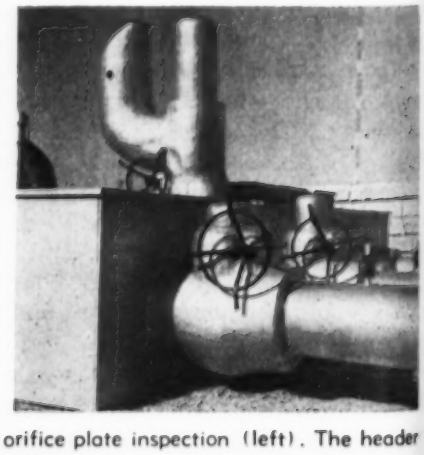
The first step in sound reduction was to cover the entire station with an acoustical sheet of glass fibers, 2 in. thick and faced on one side with aluminum foil. The 20-in. header below the regulator was given a double wrap and boxed with ¾-in. plywood. A 2-in. air space was left and 1-in. layer of sound-absorbing board was added. Six inches of sand were placed in the bottom of the box. Space around the pipe was filled with glass wool. The balance of the station was insulated with alternate layers of deadening felt and 1-in. layers of hair felt. Straight runs of pipe were further covered with a layer of 45-lb roofing felt and a final jacket of 26-gauge aluminum. Ells, tees and valves were treated with two ½-in. coats of asbestos-cement, and these surfaces were weather-proofed with fibered asphaltic emulsion. Cost of the entire project was $4 per square foot of surface covered. Sound readings were taken with a sound level meter at various stages of the job in order to determine the best application of insulating materials.

Reduction in sound level

The sound level was reduced from near 100 decibels (noise comparable to that in a boiler factory) to near 70 decibels (normal work conditions). Regulator noise is now barely audible 30 ft away.

Experiences at these stations indicate that noise need not accompany efficient operation of gas pressure reducing and measuring stations. With the proper use of modern insulation materials and the help of the sound level meter for comparison of sound levels before and after physical changes are made, regulators can really be hushed.





Where necessary, insulation is detachable for orifice plate inspection (left). The header at right is barely heard 125 ft away since insulation.

This article appeared originally in *The Flow Line*, published by Rockwell Manufacturing Co.

Chicago's Navy Pier (left), more than one-half mile long, is said to be one of the longest spaces under one roof ever heated. The twin heating units (right) are placed 40 ft apart along the inside walls, 10 ft above the floor. Note the expansion loops that had to be put in the 6- and 12-in. gas lines to compensate for the total 16-in. expansion and contraction of the second deck.

Gas answers another heating challenge—Chicago's Navy Pier

HEATING an unpartitioned building 2260 ft long, erected over a lake and exposed on three sides to subfreezing blasts of penetrating 40- to 45-mile per hour winds, constitutes a situation that even the best heating engineers are likely to shy away from. And when they learn that the walls of this building are made almost entirely of glass framed with steel and that there is no insulation whatsoever, their desire to steer clear of such a job soars.

This, essentially (with a few other complexities), is the task that confronted the City of Chicago and engineers of the Peoples Gas Light & Coke Co. in installing heating equipment in the second deck of Chicago's Navy Pier.

The pier was originally designed as a municipal pier for use as a terminal for Great Lakes freight and passenger service. Construction was started in 1914. Besides being used for its original purpose, the pier has accommodated large recreational concessions and Navy personnel during World War I and II. Prior to the installation of the heating system, the first exhibit, in 1920, and all subsequent ones were held during the summer months.

The space currently used for exhibitions, having a total floor area of 293,040 sq ft, is made up of a north and a south section. The basic construction consists of structural steel longitudinal and transverse beams which support a concrete floor. The 18-ft sidewalls, made of metal-framed glass, rise to sloping concrete slabs which make up the roof. Running the entire length of the structure is a canopied glass skylight which may be opened for ventilation. There is no heat insulation other than that afforded by the plywood paneling, which forms the lower false backwall.

The total estimated heat loss of the two halls is 38 million Btu's per hour, or approximately that lost from 480 homes of average size. The choice of a heating system to combat this unusually high heat loss was limited by several factors. The narrowness of the building precluded the use of any equipment that would reduce the available floor space. The intermittent usage to which the system was to be put ruled out the use of a central steam or hot water system because of the elaborate precautions against freezing that would be necessary between conventions. The necessity for accurate measurement of fuel for each exhibition, together with fuel storage and attendant delivery problems, seemed to narrow the possibilities down to gas-fired unit heaters.

Surface Combustion engineers, called in to decide the most efficient way to solve the heating problem, decided to couple together two standard 200,000-Btu units into a single steel jacket and suspend one such unit from roof members next to the inside wall every 40 ft. Air in the dual units is circulated by two squirrel-cage rotary blowers mounted on a single shaft and driven by a 1-hp motor at a speed of 600 rpm. Each twin unit heats and circulates 5800 cu ft of air per minute.

Air is supplied by a cold air intake running from each heater to within 3 ft of the floor. A manually controlled damper regulates the incoming air, either fresh air from outside or recirculated air from within the building, entering through a 4-ft by 1-ft intake. One hundred seventeen heaters were installed and have successfully maintained a temperature of 70° F with an outside temperature of 10° below zero.

In order to secure an adequate supply of gas for the installation it was necessary for Peoples Gas to lay 7000 ft of medium pressure gas main—3000 ft of 12-in. and 4000 ft of 6-in. main. Because of the 16-in. variation in length of the line within the enclosure, due to expansion and contraction resulting from temperature fluctuation from —10° to 100° F, it was necessary to build several expansion loops.

During the summer the fans on the heaters are used for ventilating the exhibition halls. For certain types of exhibits, such as flower shows, some sections are heated above normal temperature while others are left unheated, demonstrating the flexibility of the system.

This is what started it all

IF...
you have money to burn, go ahead and burn NATURAL GAS!
OIL HEAT
COSTS LESS, MUCH LESS
THAN NATURAL GAS
Yes, you can realize substantial savings . . . money in your pocket . . . by using safe, dependable, clean oil heat instead of natural gas. Even figuring natural gas costs at the LOWEST RATE for home consumption, you can save more than 23% on heating costs during the year by using oil heat instead of natural gas. These are FACTS, prepared by competent heating engineers. Buying or building a home, or converting your present heating system, be sure to consider the savings you'll make every month you use oil heat. Call your nearest fuel oil dealer for complete information. There are 52 independent fuel oil suppliers in the Richmond area to serve you.
• OIL HEAT is fully automatic
The exact degree you want at the flick of a finger
• OIL HEAT is dependable
There are 52 independent suppliers at your beck and call
• OIL HEAT is clean
Fuel oil burns completely, efficiently
• OIL HEAT is safe
Fuel oil is nontoxic, can't even be ignited accidentally
Look What OIL Saves You!
YOUR NATURAL GAS BILL WAS* | EQUIV. OIL WILL COST* | USE OF OIL WILL SAVE
$105.00 | $ 80.63 | $24.37
147.00 | 112.88 | 34.12
189.00 | 145.12 | 43.88
231.00 | 177.37 | 53.63
OIL HEAT IS BETTER and CHEAPER
YOU SAVE MORE THAN 23% WHEN YOU HEAT WITH FUEL OIL INSTEAD OF NATURAL GAS
RICHMOND OIL-HEAT ASSOCIATION, INC.

Gasmen challenge heating claims of oil industry

By WILLIAM BIEN

GAS report

WITH the booming expansion of their business demanding undivided attention, the natural gas executives in Richmond, Va., didn't want a scrap and certainly didn't start one.

But since the Richmond Oil Heat Association declared open war early in July, the gas men have demonstrated that they can handle themselves handsomely.

There's a lesson for the industry in the explosion at Richmond. Trouble has been brewing, actually, for several years. A group of 52 independent oil dealers in the Richmond area developed a smoldering resentment at the arrival of the newcomer, natural gas, and their slow burn grew as the new fuel caught on with the public.

An executive of Commonwealth Natural Gas Corp., which supplies fuel for the City's Department of Public Utilities, explained it this way:

Small competition

"Until three or four years ago, the oil men were coasting along, leaving their offices early in the afternoon and charging whatever they wanted. Their only competition was coal. It was a nice situation.

"Then, suddenly, they realized that all this talk about natural gas was more than a lot of hot air. They began to worry. . . ."

The oil men found they had to fight for business in the new suburban areas of Richmond, as householders learned about the heating qualities of natural gas.

Easy way out

Then an easy way out of having to hustle for business occurred to the oil men: They'd finagle legislation to favor them in the areas of new home construction, just beyond the city limits.

City Councilman Phil J. Bagley introduced a resolution that would have done exactly what they hoped for: ban any extension of the city's gas utility services beyond the corporate limits of Richmond.

However, the resolution failed even to get a seconding motion and became a dismal flop.

The oil industry's first ad (left above) claimed that the consumer saved more than 23% when using fuel oil for heat.

That did it. The oil industry's pot of indignation boiled over. Spokesmen for the independent merchant's group touched off the explosion with a full seven-column advertisement in the *Richmond News Leader*, an evening newspaper with more than 100,000 circulation, on July 6.

"If you have money to burn, go ahead and burn natural gas!" That was the essence of the oil industry's first blast.

No fight?

Because the natural gas industry had been going about its own business so quietly in this area, many people got the false impression that the executives were going to take the charge meekly. They soon found out how wrong they were.

Edward J. Metzger, the hard-fisted director of public utilities in Richmond, started an immediate counter-attack. He wrote a letter to every builder and developer in the suburban areas, jabbing at the oil men where it would hurt them most—right in their costs.

Mr. Metzger pointed to the comparative costs of heating by gas and oil. He underlined the extra heating value of natural gas that offsets the slightly higher unit cost. He mentioned what the oil dealers had neglected to bring out—that annual cleaning of oil burners, with a service charge of from $15 to $18.50—runs up the cost of heating with oil, while the gas distributing company cleans its units without charge.

By July 20, Mr. Metzger was ready with an advertising campaign for the city—the first big advertising program ever started by the utility department. The first advertisement, prepared by the Richmond advertising concern of Cargill & Wilson, appeared in the *Richmond News Leader* on July 20 and in the *Richmond Times-Dispatch* on the morning of July 21.

Hit the weak spot

This advertisement was a jolting uppercut to the oil industry's weak spot. Mr. Metzger had obtained a letter from the independent engineering company, Ebasco Services, in New York, saying:

"At your request we have reviewed the comparison of costs of natural gas heat and electric-driven oil heat for your average residence heating customers, as contained in your letter of July 12, 1954.

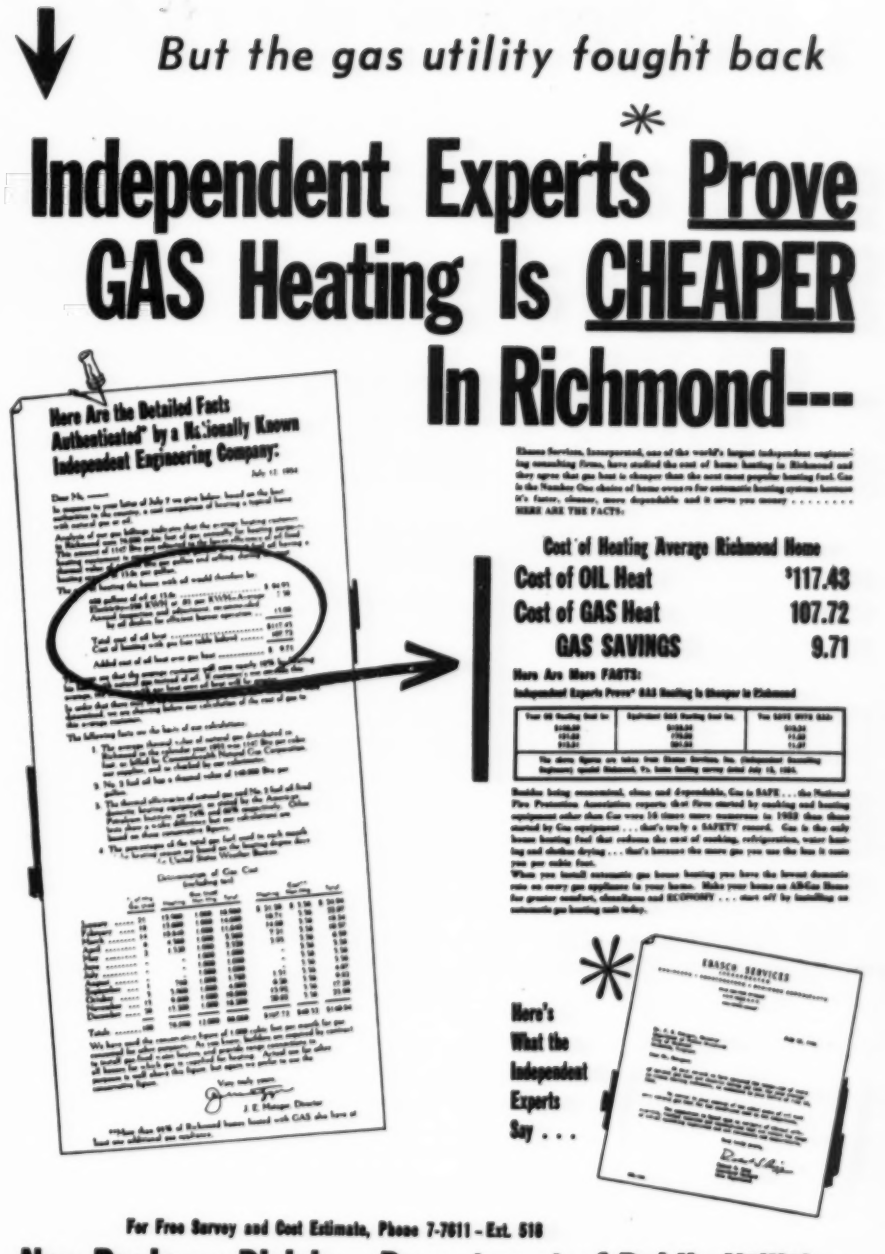
"We concur in your summary of the added costs of oil heat over natural gas for the conditions used in the comparison.

Conservative estimate

"The comparison is based upon an estimate of thermal efficiencies, thermal contents and consumptions that are within the range of actual operating experience and are reasonable and conservative."

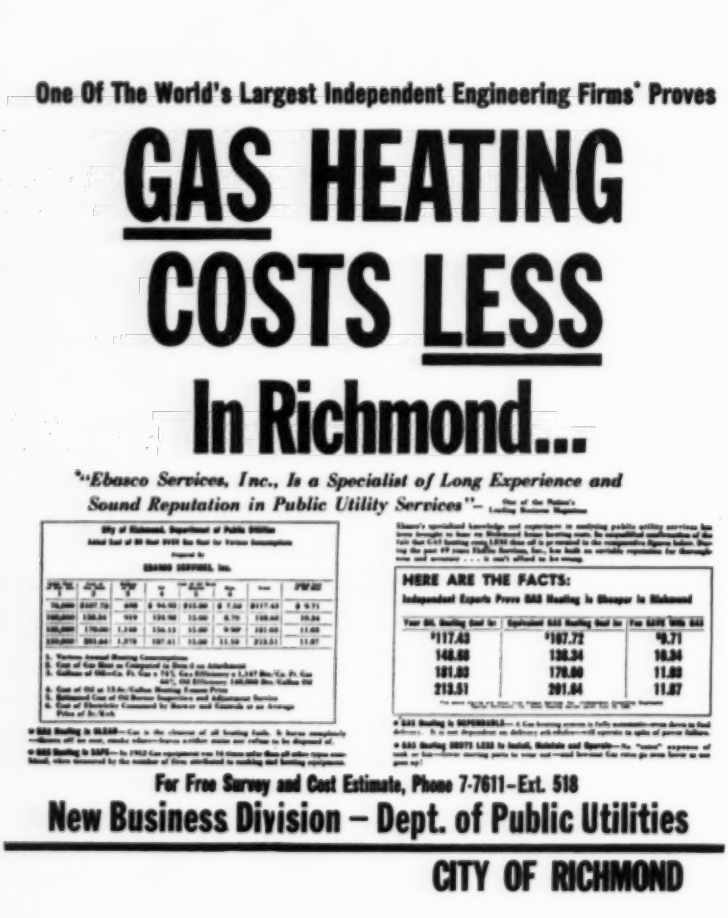
Mr. Metzger said it in his first advertisement, and he said it everywhere he had the chance: Gas heat is cheaper. He showed the facts, that the annual cost of heating the average Richmond home with oil is $117.43 and the cost with gas is $107.72—a saving of $9.71.

In other advertisements, the City Department of Public Utilities has gone into detail about costs. In one ad, based on the study by Ebasco Services, the city printed figures to show that 150


But the gas utility fought back
Independent Experts Prove GAS Heating Is CHEAPER In Richmond---
Here Are the Detailed Facts Authenticated* by a Nationally Known Independent Engineering Company:
Cost of Heating Average Richmond Home
Cost of OIL Heat $117.43
Cost of GAS Heat 107.72
GAS SAVINGS 9.71
Here Are More FACTS:
Here's What the Independent Experts Say . . .
For Free Survey and Cost Estimate, Phone 7-7611 - Ext. 518
New Business Division - Department of Public Utilities
CITY OF RICHMOND

Richmond's utility department got its first big ad campaign underway with this blast at the oilmen's figures.

. . . and then they met HEAD ON!



Richmond's department of public utilities used Ebasco's figures to prove that gas heating costs less in Richmond.

The Richmond Oil Heat Association tried to prove just the opposite with the above ad.

Mcf of natural gas costs $201.64. The equivalent heating in oil—1378 gal.—costs $187.41 for the fuel alone, plus $15 for burner inspection and adjustment and $11.10 for electricity to operate the burner and controls. The saving, by this calculation, is $11.87 for gas.

Billboard campaign

Meanwhile, Commonwealth Natural hasn't been sitting back and doing nothing. Commonwealth's young president, William H. Trapnell, ordered a group of simple, effective gas messages for 16 billboards in the Richmond area and 15 in the areas around Portsmouth, Suffolk, and Petersburg, where Commonwealth also operates.

These billboards state only that "GAS HEATING COSTS LESS."

"We have to keep our advertising on an institutional basis," said an official of Commonwealth. "We don't control rates in Richmond, so our job is to see that gas generally isn't hurt by this fight.

"We are not going to call names. We will just tell our story."

There is no indication that the battle of the advertisements will end soon. The oil men have prepared a 13-week campaign . . . and the City Department of Public Utilities is ready to give as good as it gets.

Methods revealed

"This situation should be of profound interest everywhere," said one gas executive. "It shows the methods of advertising the oil dealers are using.

"They don't tell an outright lie. They just don't tell the whole truth, for instance, about the added oil costs for burner inspection and electricity.

"Theirs is a sharper form of advertising than we would be inclined to use."

Disapproval

Another executive of Commonwealth said he understands the big oil companies are not taking an active part in the fight, and that they do not approve entirely of the independents' advertising messages.

The gas executives aren't afraid of the outcome but, on the other hand, several of them would be happy to see the end.

"This was forced on us," one said, "and, of course, we can't sit back and take it."

GAS selected bibliographies

3. Conversion to natural gas

This is the third in a series of selected listings of articles that have appeared in GAS over the past 30 years, covering a broad variety of subjects of particular interest to the gas engineer.

1926

Natural Gas for the Homes of Fort Collins — the First Changeover in Colorado, George Wehrle, *April, p. 17.*
Historic Cheyenne Turns to Use of Natural Gas Fuel, Robert H. Taylor, *July, p. 17.*

1927

Natural Gas Service Is Begun for Los Angeles, *Feb., p. 37.*

1929

Load Building in Denver Accompanying the Changeover to Natural Gas, Robert H. Taylor, *May, p. 58.*
Denver's First Year of Natural, F. T. Parks, *Nov., p. 35.*

1930

Modernizing Salem's Gas Service, J. G. Reddick, *July, p. 31.*
Preparing a 101,000-Meter District for Natural Gas Service, Elliott Taylor, *Aug., p. 23.*

1931

Efficient Changeover Methods at Bismarck, N. D., Albert P. Thomas, *July, p. 26.*

1932

Changeover Experience on the United Light and Power System, O. K. Smith, *Jan., p. 27.*

1934

Arizona Extension Rounds Out Another Market for Natural Gas, George H. Finley, *Feb., p. 12.*

1936

Detroit Changeover, Craig Espy, *Sept., p. 24.*
Steam Plant Changeover, William H. Riach, Jr., *Nov., p. 11.*

1937

Detroit Writes Finis to Natural Gas Project, F. P. Fisher, *Jan., p. 11.*

1938

Changeover — Fort Wayne Again Turns to Natural Gas Service, *Mar., p. 22.*

1940

Converting an Oil Line to Natural Gas Transmission, O. C. Irvine, *May, p. 33.*

1941

When a City Changes to Natural Gas, Guy Corfield, *May, p. 33, June, p. 23, and July, p. 19.*

1942

Natural Gas Arrives in Pontiac, Michigan, *Oct., p. 46.*

1943

Consumers Power Co. Natural Gas Changeover, *Jan., p. 21.*

1946

Future Prospects for Natural Gas, G. G. Oberfell, *Jan., p. 23.*
Gas' Survey Shows: In One Year 229 Cities Applied for Natural Gas, *Dec., p. 40.*
Interchangeability (Technical Trends), Guy Corfield, *Dec., p. 57.*

1947

Student Engineers Handle Changeover, S. S. Caldwell, *Sept., p. 40.*

1948

Adapting Omaha to Natural Gas, S. S. Caldwell, *Feb., p. 32.*
PG&E Replaces Oil Gas Facilities, *Mar., p. 47.*
Battle of the Fuels (Technical Trends), Guy Corfield, *April, p. 29.*
Will New England Be Next? Edward Titus, *May, p. 37.*
Advantages of Converting, E. D. Anderson, *May, p. 76.*
Northeastern Utilities Lay Plans for Utilizing Natural Gas, Edward Titus, *July, p. 33.*

1949

Introducing Industry to Natural Gas, Paul R. Taylor, *Feb., p. 50.*
Interchangeability of Oil Gas With Natural Gas, Arthur W. Krause and A. M. Cunningham, *April, p. 60.*
What About Natural Gas for New England? Erick Larson, *May, p. 42.*
Gotham Invaded — Staten Island First to Receive Natural Gas, *Aug., p. 48.*
How New England May Get Natural Gas, Edward Titus, *Oct., p. 89.*
Using Natural Gas in a Manufactured Gas System, (Part I), E. G. Boyer, *Dec., p. 27.*

1950

Using Natural Gas in a Manufactured Gas System, (Part II), E. G. Boyer, *Jan., p. 40.*
*Natural Gas Spreads Through Eastern Wisconsin, *Feb., p. 48.*

Starting with the January issue, GAS magazine will publish a monthly series of articles on the recently adopted safety code for gas transmission and distribution piping. The articles will be written expressly for GAS by Frederic A. Hough, chairman of the ASA subcommittee which spent more than two years in writing the code.

The monthly articles will discuss much of the background which led to the adoption of the code in its present form. As such they will serve as an aid to those in the industry who during the following months will be charged with the responsibility of analyzing the various provisions of the code for application to specific transmission and distribution installations.

The series will be published in such a way that the articles can be conveniently clipped and kept in a file folder or ring binder.

15 Years of Natural Gas 30 Miles from 42nd Street, Charles L. Hulswit, *Mar., p. 27.*
*Post-Changeover Problems Plague Milwaukee Gas Light Co., *Mar., p. 61.*
Problems of Interchangeability, M. Frank Knoy, *May, p. 31.*
Appliance Adjustment Costs and Procedures, George B. Johnson, *May, p. 33.*
Combination Burners Using Oil and Gas, C. C. Young, *May, p. 34.*
Leakage, Dust Fogging, and Humidifying, Robert H. Taylor and Donald J. Miller, *May, p. 35.*
Natural Gas' Effect on Meter Performance, G. B. Dushane Jr., *May, p. 38.*
More About Meters, C. W. Stewart, *May, p. 40.*
One-Step vs Several-Step Changeovers, George B. Johnson, *May, p. 40.*
Revival in Northeast, *May, p. 71.*
First Natural Gas Comes to Eastern Tennessee, Arthur B. Allyne, *May, p. 103.*
*Elizabeth to Convert in Fall, *June, p. 54.*
How Five Companies Joined Forces to Bring Gas to New York, F. G. Sandstrom, *Aug., p. 29.*
*Natural Gas Arrival Brings Rates Down, *Aug., p. 76.*
Imported Natural Gas for Northwest "Probable" — Manning, *Sept., p. 98.*
Conversions: How They Affect Work on Customers' Premises, R. H. Bussard, *Oct., p. 61.*
*Contracts Let for Conversion, *Oct., p. 78.*
Predicting Interchangeability of Fuel Gases, Louis Shnidman and Jesse S. Yeaw, *Oct., p. 98.*
*Conversion Planned in Indiana, *Oct., p. 132.*
Experts Give Their Views on Ticklish Changeover Problems, *Dec., p. 25.*
Texas Gas Reaches Gates of Gotham, *Dec., p. 73.*

1951

*Texas Gas May Reach New England by Labor Day, *Jan., p. 84.*
Effects of Conversions on Meters, J. M. Pickford, *Feb., p. 25.*
Natural Gas for Remaining New England Areas Approved in Record-Breaking $240 Million Certification, *April, p. 108.*
Role of Public Relations During a Conversion, W. P. Woods, *May, p. 60.*
New Englanders Emphasize Conversion Problems, *May, p. 64.*
*New York Cities Convert, *July p. 56.*
*Conversion Problems Aired, *Aug., p. 77.*
*Vacations, Night Life Lure Slow New York Conversion, *Sept., p. 68.*
Portland's Experiments With High-Btu Oil Gas, James F. Bell, *Nov., p. 53.*
Baltimore's First Year With Natural Gas, Charles P. Crane, *Dec., p. 31.*

1952

*Biggest Utility Conversion Planned by Brooklyn Union, *Jan., p. 68.*
*Miami Beach Conversion, *Feb., p. 85.*
Conversion Need Not Be An Ordeal, George E. Gregson, *Mar., p. 33.*
*Brooklyn Union Changeover Set for March 6, *Mar., p. 56.*
*Conversion Work Started by Three Companies, *May, p. 74.*
Northeastern Completes Connecticut Line, *Oct., p. 156.*
Conversion of Greenpoint to a High-Btu Gas Plant, W. E. Tate, *Nov., p. 38.*
Brooklyn Union Installs Permanent Oil Foggers, *Dec., p. 35.*

1953

*Cascade Natural Gas Corp. Incorporated in Seattle, *Feb., p. 83.*
NEGA Panel Recounts Conversion Experiences, *May, p. 29.*
*Ground Breaking Climaxes Eight-Year Fight for Gas, *July, p. 114.*
Economics of Peak Shaving Natural Gas, C. T. Chave and B. C. White, *Oct., p. 50.*
*ConEd to Convert Remaining Areas to Natural Gas, *Dec., p. 86.*

*Indicates news items.

United Gas Corp. expects big returns from Old Stove effort

ANY utilities that have found their enthusiasm (and that their cooperating dealers) for the Old Stove Roundup tailing off in the past several years could do a lot worse than to pattern their 1955 campaign after the supercharged 1954 promotion that United Gas Corp. carried on throughout its Gulf South system.

Complete returns are not in yet, but the $100,000 spent by United Gas in stimulating its 1800 dealers to "get off their hammocks" has had a strong impact on the volume of distributor range orders. Many small-town merchants found themselves ringing up sales as high as a range per day, and orders for carload lots were being taken for the first time in years.

A big chunk of United's budget went into "Operation Stimulant," an 18-day, 1900-mile caravan that passed through 12 major cities in the Mississippi-Louisiana-South Texas area and set the stage for the big co-operative effort. The program of the tour was built around a 30-minute melodrama starring Chuckwagon Charlie, a western character decked out in full range regalia and sporting a handlebar mustache. The plot, in essense, has Charlie straightening out the sagging sales curve of his dealer friend, Slug. Charlie and Slug's travel companions included a western band, a photographer, and two men from Bozell & Jacobs, the United ad agency.

Dealer Slug awakens to sales potentials through urging of Chuckwagon Charlie at climax of three-minute melodrama.

The troupe, traveling in a two-decker bus, preceded the Roundup kickoff. Their shows, which were combined with a dinner and a half-hour sales talk, were staged for large groups of dealers. Public appearances were also arranged, including TV guest shows, charity drives, and newspaper picture-taking sessions in dealer showrooms. The dramatic punch was backed up with some real dealer helps, too: incentive plans, financing of paper for smaller dealers, a nearly doubled volume of newspaper advertising, TV and commercial spots on 60 stations.

The campaign also strongly urged dealers to hook up at least one range to a service line, so as to have a live display. Apparently, few dealers on United lines had previously set up gas ranges for such demonstrations.

Special campaign materials distributed by United tied in the Chuckwagon Charlie theme on banners, emblems, pennants, and easel cards.

United is hopeful that the enthusiasm generated in the single campaign will be maintained at a level that will start turning back the tide of electrical competition, which has become a very real peril in the Gulf South as it has everywhere. Saturation percentages of gas ranges have slipped from 97% to 85% in Houston, in the heart of the gas fields, and from 95% to 80% in Mississippi—all within the past seven years. An intensified dealer help program, kicked off by Operation Stimulant, will be the key

How to move a 540-ft section of 30-in. pipe

Trench on right is where 540 ft of 30-in. cast iron pipe had to be moved.

THE New Orleans (La.) Public Service Co. was recently faced with the rather unusual job of moving a 540-ft section of a 30-in. cast iron gas pipeline from its original location to a new trench 5 ft away.

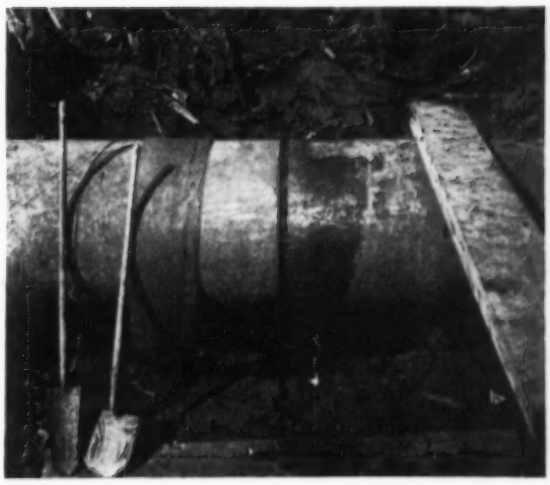
The pipe joints had originally been clamped with Dresser Style 60 bell joint clamps. Because of the soft foundation, each joint had also been encased in a narrow rectangular block of concrete.

After the pipe had been uncovered and the trench widened to include the new location, the pipeline was cut into four sections about 140 ft long with a Wachs pipe saw. Two cuts were made at each point, so as to remove a 1½-in. ring of pipe and thus provide sufficient clearance to permit lifting the 140-ft sections without damaging the cast iron pipe ends.

Two 20-ton mobile cranes were used to move these 140-ft sections, which weighed approximately 25 tons each.

After the entire line had been moved to the new location, the four sections were rejoined with Dresser Style 38 couplings. The ends of the relocated line were then reunited with the old line by using 30-in. steel offsets connected with Dresser reducing couplings, Style 62.

After completing the operation, the line was tested and no leaks were found in either pipe or joints.



Pipe was cut into 140-ft sections. Two cuts were made as shown with a 1½-in. ring removed. This provided enough clearance to lift section without damaging pipe ends.

Two 20-ton mobile cranes lift and move one 140-ft section. Weight of section is approximately 50,000 lb.

Two sections of pipe resting in new location are about ready to be joined together using Dresser Style 38 for cast iron.

Good-neighbor policy saves Arkansas community in time of distress

Instead of the gas it was built for, this line carried water until the reservoir was well stocked.

RESIDENTS of Nashville, Ark., a town of 3500, have learned from the Arkansas Louisiana Gas Co. what a good-neighbor policy can do in a time of distress and threatened disaster.

The third consecutive summer of severe drouth in Nashville left the city-owned water reservoir—Lake Nichols—with a meager 12-day supply, and in late August 1954 the overworked city filter plant was operating 24 hours a day to remove impurities from the shrinking pool of silt-laden water in the middle of the mud-dried dam and reservoir on Mine Creek. Two emergency lines of portable aluminum pipe, each manned with a pump, had been run by the city council's workmen to small streams in the vicinity, and Mayor H. A. Dildy and the councilmen were desperate for a solution of the growing emergency when the gas company offered aid.

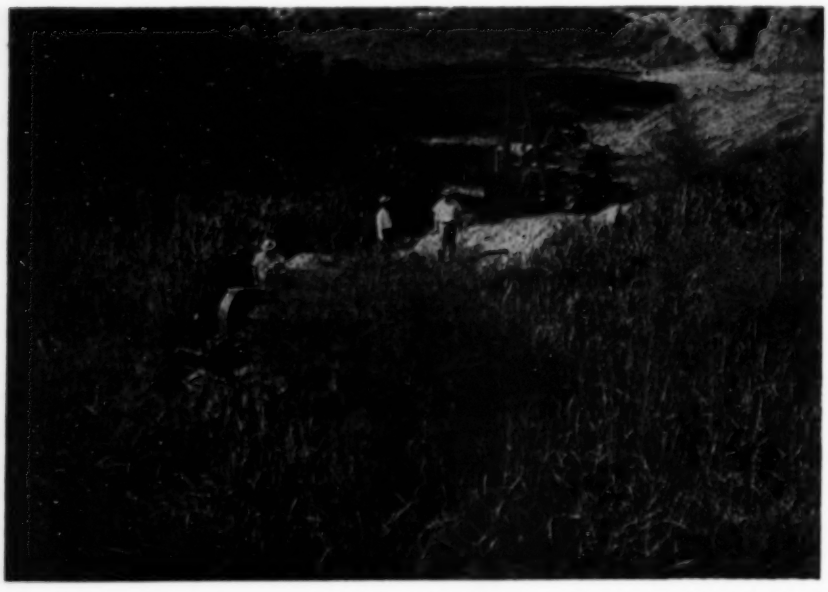
A newly completed line from the company's mains near Nashville had been built to the town of Murfreesboro, 14 miles distant, and financed with funds from a bond issue guaranteed by Murfreesboro property owners. The gas company had leased the line on a long-term basis and was at the point of making final connections and beginning gas service to the area when someone suggested use of the newly completed gas line to carry water to drouth-stricken Nashville from the Little Missouri river, which the line crosses.

Gas company officials attended an emergency meeting of the Nashville council and told that beleaguered town's officials, "This job won't cost you anything—we're part of Nashville, too." At the same time, Murfreesboro officials authorized the use of the gas line for water service, and the contractor asked for and received an acceptance of the line which absolved him from responsibility. The gas company engineers supervised laying of connections at either end to a nine-mile stretch of the new gas line between Nashville and the river, and crews worked around the clock to meet the growing emergency on a weekend when the temperature reached 100°.

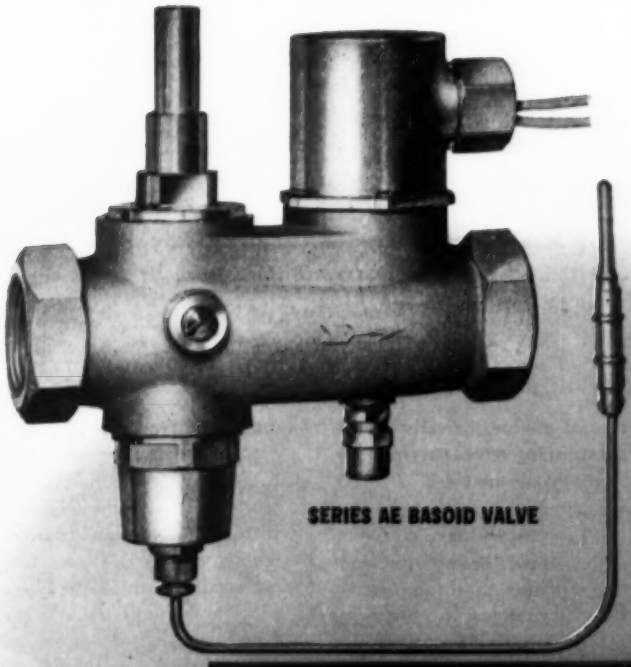
Lack of a suitable pump threatened to delay the project, but gas company officials in Shreveport, home office of the company, located a heavy-duty 125-hp, butane-driven pump there, rushed it by special express truck with orders not to stop until it was delivered, and set it up on the river bank as the line connections were completed. The only cost to Nashville was a nominal $20 for rental for the pump and the wages of watchmen to look after it.

Shortly after midnight on a Saturday when Nashville residents had only a few days' supply of impure water left, a stream of clear river water poured into the empty reservoir and the city filter plant at the rate of 175 gal. per minute. In two weeks' time the reservoir contained enough stored water to see the town of Nashville through until fall rains began. Then, again, the gas company assumed the expense of cleaning the gas line and preparing it to provide natural gas for Murfreesboro in early weeks of the fall school term.

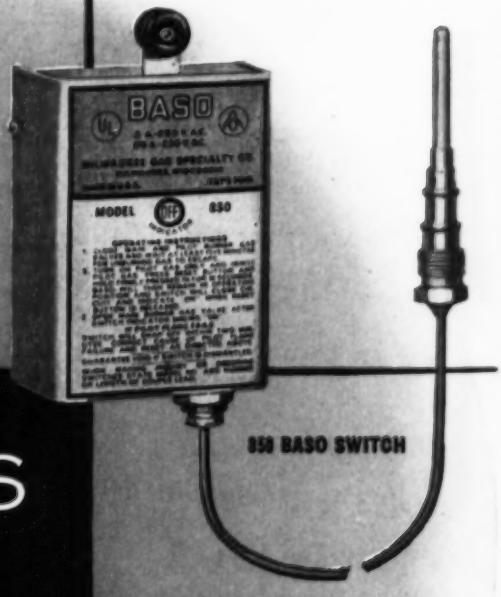
"We could never have worked out all these agreements and arrangements by ourselves," Mayor Dildy said with feeling. "I don't know what our town would have done if the Arkansas Louisiana Gas Co. and our neighbors at Murfreesboro hadn't come to our rescue. We've voted a bond issue to enlarge our water system, and this should never happen again, but we'll always remember that the gas company proved our friend and neighbor in time of serious need."



Clearing the way for emergency water service. Crews worked around the clock to finish the job.

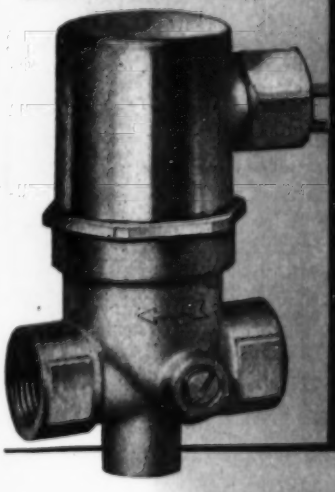


SERIES AE BASOID VALVE



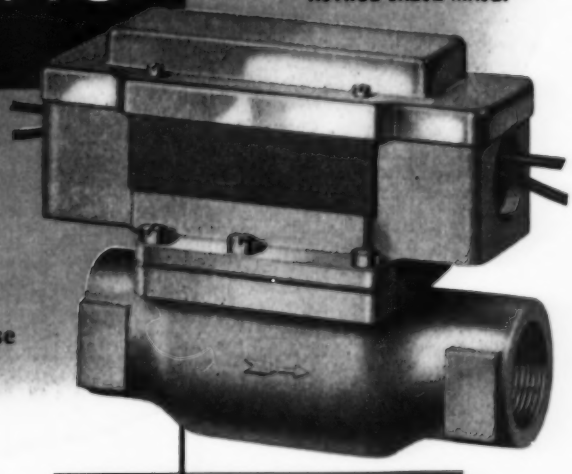
850 BASO SWITCH

SERIES EA SOLENOID VALVE



CONTROLS FOR AUTOMATIC GAS FIRING

ACTROL VALVE MASGI



Look at this line up of controls for automatic operation of your gas appliances.

The Actrol® valve, quiet, stronger to open against gas pressure, with built-in transformer—

The Basoid® valve, space-saving and self-sufficient because it combines in one body a solenoid valve and the Baso automatic pilot, standard of an industry—

The MGSCo Solenoid valve with stainless steel and aluminum parts to resist corrosion of sour gas—

The No. 850 Baso® automatic pilot switch which monitors the operation of the Actrol, Basoid, and Solenoid valves—

In these you can find the combination best suited to give you the years of reliable, service-free operation you want for any type of automatic gas appliances. There's lots more to this story. Drop a card to us; we'll see that you get it.

MILWAUKEE GAS SPECIALTY CO.

Dept. SC-3
MILWAUKEE 1, WISCONSIN

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.

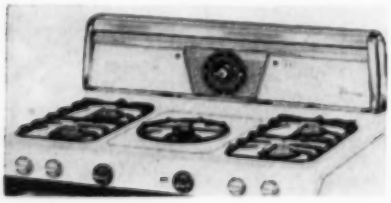
1 Controlled Top Unit

Four models of Florence Stove Co.'s 1955 ranges will feature a thermostatically controlled surface unit that acts automatically and serves all the purposes of griddle-toasters, deep fat fryers, controlled heat pan fryers, and food warmers.

Secret of the new feature is a thermostatically controlled fifth burner in the center of the top surface. An aluminum sensing element, located in the center of the burner, measures temperature of food inside the cooking vessel and thermostatically keeps this temperature constant, never varying, for the period needed to cook the food.

Available with either a burner or griddle top, the new development will take all cooking vessels—glass, copper, aluminum, steel cast iron, etc. It operates as simply as an oven thermostat with heat markings in infinite steps from 200° to 400°; reprives the homemaker from constant supervision of the burner; means smoke-free and splatter-free kitchens.

Florence Stove Co.



■

2 Trenching Machine

Controls have been rearranged on the Earthripper, mobile trenching machine manufactured by Owens-Pewthers, so that they are within easier reach of the operator. Controls include infinitely variable conveyor belt speeds to 750 ft per minute. Crowd speed is also variable over a continuous range of 0 to 30 ft per minute. All operations are hydraulically performed except for driving the bucket line and roading.

Only one man is required to operate this rubber-tired machine that has road speeds to 55 mph. Truck engine furnishes all power. It digs at any angle from vertical through the 90° arc of the boom. The borium-faced replaceable teeth on the bucket shave off ¼ to ½ in. of the bank at a time. The Earthripper digs to 8-ft depths and from 10- to 30-in. widths.

Owen-Pewthers Manufacturing Co.

■

3 Combination Safety Valve

Protection against over-pressure and fuel-fed fires in gas installations is afforded in a new combination safety valve manufactured by Valco Inc. Designated as Model 350, the new valve is designed for installation just ahead of gas meters in homes, hospitals, schools, public buildings, etc.

The valve, which can be mounted in any position, can be located in any section between the gas meter and the pressure-reducing valve. It is vibration- and explosion-proof. The flow of gas is under the seat. When closed, only the disc and spring are needed to prevent flow. The entire operation head can be knocked off in an explosion and the valve remains closed.

Valco Inc.

■

4 Cathodic Protection Meter

A weatherproof meter, which is to be mounted along coated, cathodically protected pipelines so that the checking of protection can be made a routine matter, has been announced by Agra Instrument Co.

While useful on transmission lines, the cathodic protection meter is particularly suitable to city plants. It is claimed to be the first commercial meter permitting meter readers and others to obtain the same pipe-to-soil readings as do engineers with portable meters.

Mail this Coupon

for NEW PRODUCTS INFORMATION

COPIES OF NEW LITERATURE

GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

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Presenting **the New**

CRISE

Solenoid Gas Valve

Higher Capacity

The Crise Solenoid Gas Valve has been designed to combine performance, ruggedness and simplicity for long, trouble-free service on all types of gas fired heating equipment. A soft seat is accurately centered by an improved design to assure positive shut-off and quiet operation. Corrosion-resistant parts make the Crise SV-100 and SV-110 suitable for use with all types of gases. Available in ½" and ¾" sizes, 24 V or 115 V and with or without a manual opener. Write for bulletin.

Visit our booth at the 12th International Heating and Ventilating Exposition

A Host of Features

- High Capacity
- Soft Seat Construction
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- Positive Shut-off
- Corrosion Resistant
- Suitable For All Gases

CRISE CONTROLS DIVISION

ACRO MANUFACTURING COMPANY

COLUMBUS 16, OHIO

Distributed in Canada by Leland Electric Canada, Ltd., Guelph, Ontario

The meter is furnished with clamps for 2⅜-in. pipe, and conduit to protect the wires, and backfill and electrodes. Meters to monitor up to three lines are available.

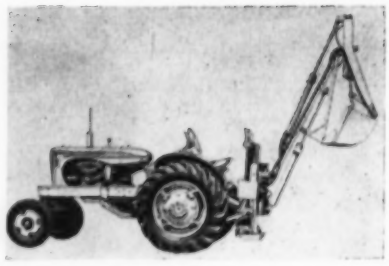
Agra Instrument Co.

■

5 Wheel Tractor

Allis-Chalmers Manufacturing Co. has added the Model WD-45 wheel tractor equipped with the Henry backhoe to its lines of industrial excavating equipment.

Weighing approximately 4000 lb, the new unit is powered by the A-C Power-Crater gasoline engine, a valve-in-head design developing 45 hp from a 226-cu in. piston displacement and a 6.5:1 compression ratio.

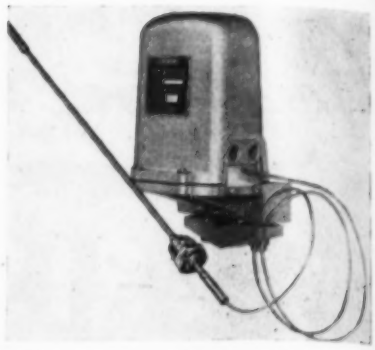


The WD-45 provides power with which to do many smaller trenching and excavating jobs. Interchangeable attachments make possible quick conversion from one job to the other.

A feature of the new model are its Power-Shift wheels, which permit the operator to quickly adjust rear wheel tread with engine power to the width required for maximum stability when working on soft ground.

Allis-Chalmers Manufacturing Co.

■



6 Temperature Transmitter

A new instrument that measures process temperatures and pneumatically transmits the information to a central recording or controlling station is available from the Foxboro Co. Known as the Model 12A temperature transmitter, the instrument is a non-indicating device of the "force balance" type with a calibrated accuracy of ½% of the temperature span and compensated for ambient temperature and barometric pressure variations.

The new transmitter is designed around a gas filled thermal system that exerts force on a flapper-nozzle mechanism in proportion to the measured temperature.

Spans ranging from 50° to 400° F are available and can be utilized between the limits of — 100° F and + 1000° F.

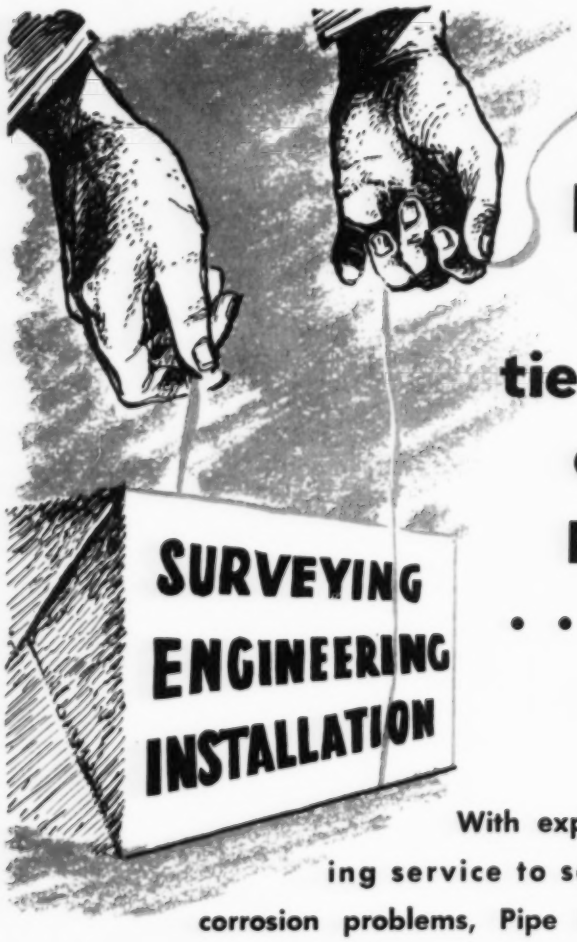
Foxboro Co.

■

7 Integrator

Rockwell Manufacturing Co.'s new integrator—a device that mechanically computes the metered volume of gases, steam or liquids from orifice meter charts—features a counter setback assembly operating from the main calibration point that enables the operator to run practically all ranges of charts at any base pressure.

The same setback principle has been ap-



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With experienced engineering service to solve any of your corrosion problems, Pipe Line Anode Corp. offers you a complete turn-key job . . . surveying . . . engineering . . . installation.

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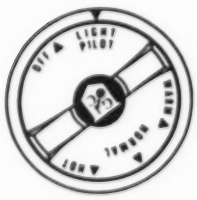
ANODE SPECIALISTS
AN·SPEC

At last a control design that gives your water heater an extra selling advantage—over and above the peerless functional efficiency you can always expect from General Controls. Its neat one-dial simplicity enhances the careful styling of your heater. But more than that, it looks **and is** easy to understand, easy to operate. Therefore, installers like it too. And why shouldn't they? It makes their selling job so much easier.

a single dial does all three

General Controls revolutionary G-5 single dial Water Heater Control sets a new standard for the industry

LIGHTING

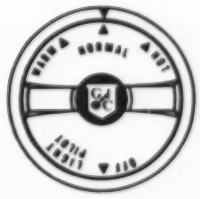


Just like other dial controls so familiar to the home. Turn to "light" and start the operation in complete safety.

RESET

If the 100% safety feature has shut off operation due to pilot failure, resetting is easily done at the same dial.

TEMPERATURE



And the exact water temperature is maintained by setting at easily read "Warm," "Normal" or "Hot" dial positions.

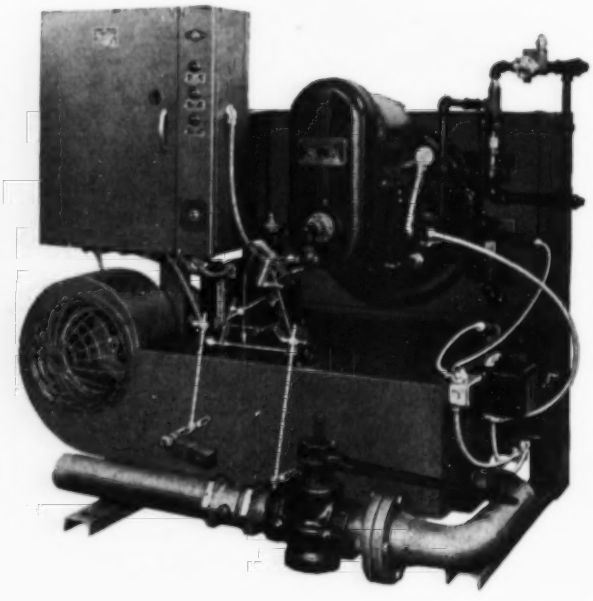
G-5

GENERAL CONTROLS

Glendale, Calif., Burbank, Calif., Skokie, Ill.
Factory Branches In 38 Principal Cities
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- Sizes from 75 to 300 horsepower.
- Minimum gas pressure requirements.
- Low installation costs.
- Maximum efficiencies on BOTH gas and oil.
- Minimum base height requirements.
- Utilizes all grades of fuel oil.
- Extremely low noise level.
- Approved electronic combustion safeguard system.
- Simpler changeover than ever before.
- One hundred per cent forced draft.
- Completely assembled, piped, wired and tested.

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

WRITE FOR LITERATURE

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***Trademark**

The WEBSTER ENGINEERING COMPANY

TULSA, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

1897 1954

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN

STOPPER COMPANY

GOODMAN — USED SINCE 1897 — 2" HANDLE & LOCKING SLEEVE — GAS MAIN STOPPER

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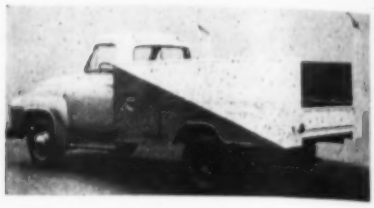
Cable Address GASTOPPER, N. Y.

plied throughout the electrically operated machine. For greater resistance to wear, points of motion or pivot points have been set in ball bearings. Other advances include improved brake assembly, redesigned static and differential carriage assemblies, new cam shifting design.

Rockwell Manufacturing Co.

■



8 Service Bodies

Among new features incorporated in the new line of Morrison service bodies introduced by Morrison Steel Products are bonderized, all steel welded construction with double lap-type joints, 18 different compartment arrangements, completely weatherproof compartments, 25 to 35 sq ft of floor-loading area, 12-gauge 4-way non-skid floor, and hinged fender panels.

The new line offers models to fit 40 different Chevrolet, Ford, Dodge, Studebaker, GMC and International chassis—½, ¾, 1, and 1½ tons.

Morrison Steel Products Co.

■

Trade Literature

9 Compaction Booklet

"Compaction Handbook" is the title of a informational booklet published by Gunderson-Taylor Machinery Co. The handbook contains complete information regarding soil compaction problems. Sources of information were the Bureau of Reclamation, the Bureau of Public Roads, and private soil engineers.

Gunderson-Taylor Machinery Co.

■

10 Instrumentation Bulletin

Instrumentation for the modern process plant is presented in the new 16-page, 1954 edition of Bailey Meter Co.'s annual Bulletin 17. Detailed equipment descriptions and illustrations include basic specifications for measuring, transmitting, receiving, interpreting, and controlling 18 variables normally encountered in production processes.

Bailey Meter Co.

■

11 Valve Bulletin

A four-page bulletin (No. 2) issued by the Atlas Valve Co. contains illustrations and descriptive paragraphs on 12 basic control valve types frequently used for gas pres-

NEW!

beauty

sales appeal

ease of service

because it's easy to get at!

NEW! Robertshaw-Grayson UNITROL® 200

FOR AUTOMATIC GAS WATER HEATERS

HELPS YOU SELL WITH ALL THESE "LEAD THE FIELD" FEATURES:

Snap-on temperature dial can be exposed while body of control can be located inside heater shell.

For exposed or concealed application.

Precision-cast body with snap-on aluminum cover available in wide choice of colors.

Colored plastic temperature dial with bright metallic center disc for heater brand name.

Combines snap action thermostat, thermo-magnetic automatic pilot, large capacity gas cock and high capacity filter.

"100% shut off" type with safe lighting feature.

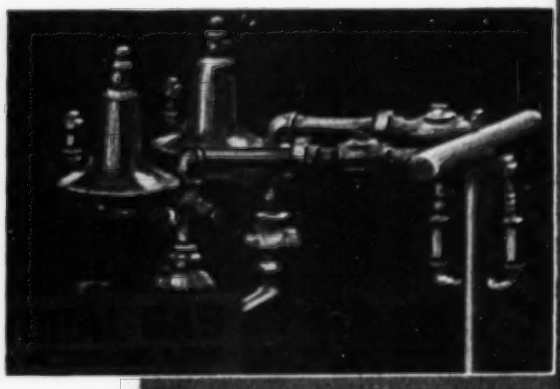
Mr. Controls®

Robertshaw-Fulton CONTROLS COMPANY

Grayson Controls Division, Lynwood, California

Robertshaw-Fulton Controls (Canada) Ltd., Toronto

A WIDER RANGE ... of Delivery Pressure Control



REYNOLDS HIGH PRESSURE LINE REGULATORS in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

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H. D. "MIKE" MEUFFELS
423 Dwight Building
Kansas City, Missouri

SEIDENGLANZ & CO.
2nd Unit, Santa Fe Building
Dallas, Texas

REPRESENTATIVES

EASTERN APPLIANCE COMPANY
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WALDO S. HULL
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Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

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Firm_____

Street_____

City_____ Zone____ State_____

sure control applications requiring precise instrumentation by means of automatic regulators. Among equipment described are two spring-loaded, diaphragm-operated and externally controlled steam reducing valves, two automatic valves for air, water or oil, and a combination high pressure reducing and relief valve.

Atlas Valve Co.

■

12 Trencher Bulletin

Cleveland Trencher Co. has issued a four-page, two-color bulletin describing its Model 240 trencher for pipelines and miscellaneous construction projects. Copy is keyed to a side-view photo of the 240 so as to clearly indicate the locations of the features described. The bulletin also contains a table of the 48 available digging wheel and crawler speed combinations and a table of optional digging widths.

Cleveland Trencher Co.

■

13 Bending Booklet

Methods of bending and joining stainless pipe and discussions of the problem of light wall vs heavy wall pipe are contained in a bulletin (TB-356) recently published by Babcock & Wilcox. Also included are a table of dimensions and weights of various stainless pipe size schedules and condensed technical data on mechanical and physical properties of the more popular stainless steels used for piping.

Babcock & Wilcox Co.

■

14 Welding Catalog

Air Reduction has published a condensed 52-page catalog describing and illustrating all of the Airco products regularly used by job shops, maintenance departments and other users of light welding and cutting equipment. It is designed to acquaint customers with Airco's line of products, explaining how each item operates and the jobs to which it is best suited. Complete specifications and stock number information is supplied.

Air Reduction Pacific Co.

■

15 Control Bulletin

Complete systems for pH recording and control, which incorporate for the first time the new Beckman Model W amplifier, are described in a new bulletin from the Bristol Co. Bulletin Q1304 gives full engineering specifications and illustrations of each component of the systems and shows methods of installing pH instruments in a number of different applications.

Bristol Co.

Thermally Thinking

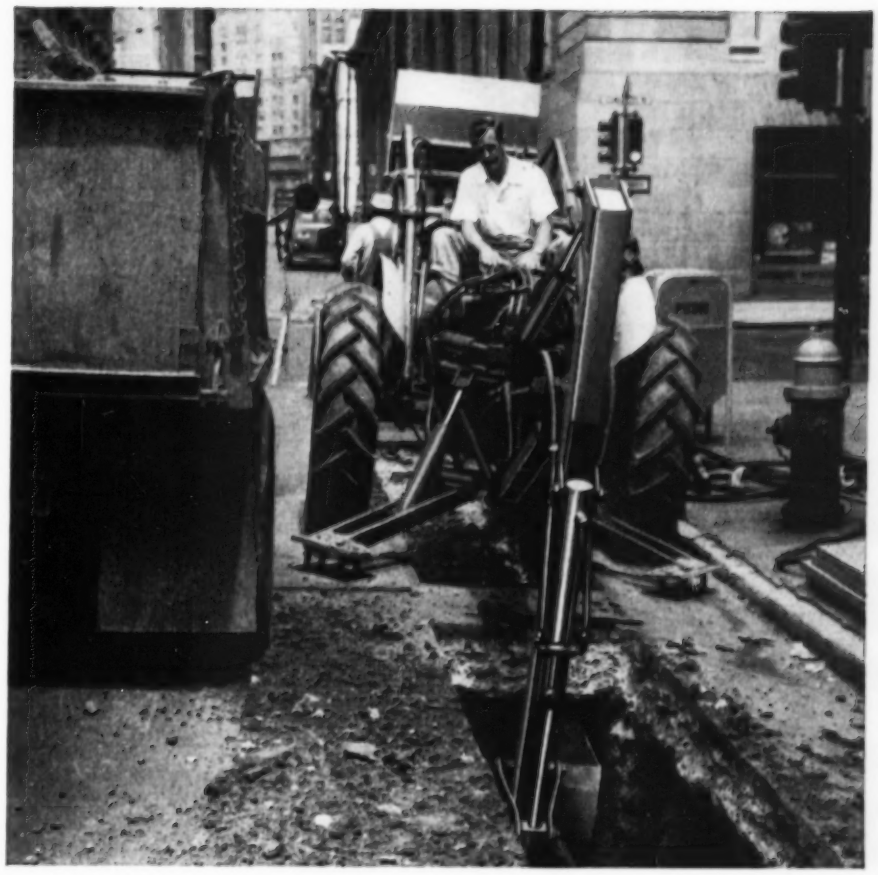
Continued from page 26

the formulation of any policy in this matter, has told the coalmen themselves that he "cannot and certainly will never be required to favor one (energy source) over another."

It's even less likely that the officials would be disposed to favor a fuel over a consumer. The committee, by the way, makes out an excellent case for the consumer. It's his battle, too, all the way. Worsening load factors would bring higher prices and a slowdown in expansion of facilities, and in the long pull, instead of having more gas for home consumption the householder would find himself with less. It's a rather simple matter of fundamental economics.

Then, too, a restrictive fuels policy would run counter to the concept of freedom-of-choice, which is a cherished principle in America. The same consumer who would shout hoorah for national regulation of wellhead prices would strongly oppose regulation, from the same sources, that tends to deprive him of the fuel of his choice. Here there should be no question as to where his best interests lie, and no amount of pro-coal propagandizing should be able to cloud the issue.

No, it won't be the fault of the AGA committee if the coal industry succeeds in its purpose. It would be the fault of the industry itself in failing to put across a fairly simple, straightforward case to the customer.



Make Emergency Repairs Faster with a Sherman Power Digger!

The job: Break up 3" of asphalt and 8" of concrete with air tools, then dig bellholes 5 feet deep for repairs to underground conduit. The location: A busy street, where traffic congestion must be kept to a minimum, repairs made, and the street re-paved for traffic to resume as soon as possible.

The solution: A Sherman Power Digger. Its actuated shovel action made it possible to dig an under-cut bellhole to the required depth with a small surface opening, thus keeping later street re-surfacing cost to a minimum. The tractor-mounted digger traveled to the site under its own power, dug at a fraction of the cost of hand labor, and saved considerable time by loading spoil directly into trucks from the excavation.

If you now excavate by hand or with machines too clumsy for jobs like this, investigate the Sherman Power Digger. It's compact, flexible, fast, easy to operate. It costs little to buy, less to maintain, quickly pays for itself. Write today for Bulletin No. J17.

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Gas industry to take part in atomic attack tests

The gas industry will participate in the 1955 series of tests by the Atomic Energy Commission to determine the effects of atomic attacks.

Arrangements have been made in cooperation with the Federal Civil Defense Administration for the installation of essential parts of a gas distribution system from the district regulator to the consumers' appliances. Duplicates of these units, located to provide varying degrees of exposure, will furnish the gas industry with valuable information for the organization and development of local procedures in the event of enemy attack.

John J. Novy, Peoples Gas Light & Coke Co., is chairman of the AGA subcommittee on atomic tests which will supervise the gas industry's participation. Chairman Novy has named Guy Corfield, Southern California Gas Co., Los Angeles, as project officer in charge. Mr. Corfield, with his deputy project officers, H. G. Laub, Nevada Southern Co., and Hugh E. Ferguson, Peoples Gas Light, will be responsible for technical details of the installation and examination and evaluation of the final results after exposure to the atomic burst.

Meanwhile, in an exercise staged last month by the Chicago civil defense corps, quantity cooking expedited by LPG appliances and equipment proved its mettle as the answer to the mass feeding problem in case of atomic attack. Smooth-working teams of LPG dealers, appliance manufacturers, and servicemen literally "saved the day," according to Frank O. Washam, chairman of the Chicago emergency mass feeding committee.

Gas substitutes insure supply for 200 years

The development of natural gas substitutes virtually insures the nation of an adequate gas supply for the next 150 to 200 years, according to a report by Capt. E. S. Pettyjohn, vice president and director of the Institute of Gas Technology.

Captain Pettyjohn pointed out that IGT in recent years has developed processes for the production of natural gas substitutes from coal, natural gas condensates, and petroleum.

"The complete gasification of coal will insure an unlimited gas supply for the foreseeable future," he said. "The institute already has developed a process of gasification of coal without coke, tar, or other byproducts."

In his annual report on the institute's activities and contributions to the advancement of the gas industry, Captain Pettyjohn attributed the rapid growth of the gas industry in the last decade to the changeover from low heating value coke oven, retort, and carbureted water gases to natural and manufactured gases of higher heating value.

"This change in many cases doubled or tripled the heating value of a utility's production, and proportionately increased the thermal carrying capacity of its mains, enabling it to serve more users," he said.

High 5-year potential for gas ranges predicted

Sales of gas ranges during 1955 could reach a potential total of 3.2 million units if economic conditions remain at the 1954 level and product design and sales promotion efforts operate at optimum. In the five-year period 1955-1959, the gas industry could produce and sell 18.4 million gas range units if these same conditions prevail.

These potentials were estimated by the AGA in a recent study. The potentials cover the maximum sales volume realistically achievable by expending the maximum promotional and product development effort short of the point where such efforts become uneconomical.

If gas ranges maintain only the current level of consumer acceptance and business conditions remain unchanged, sales should equal 2.4 million units in 1955 and would total 11.5 million units in the five-year period. A decline in consumer incomes of 10% during 1955 or 20% on an average between 1955 and 1959, would reduce gas range sales potentials by 15% during the first year and by slightly more than one-third during the entire period. On the other hand, the AGA Bureau of Statistics estimates a 5% increase in incomes during 1955 and a 10% advance in the entire period would raise the potentials by between 5 and 10%.

In last year's study it was estimated that with unchanged consumer acceptance, 1954 gas range sales would vary between 1.95 million and 2.2 million; while potential sales would be between 2.55 million and 3.15 million. Actually consumer incomes declined slightly and preliminary estimates indicate actual 1954 gas range sales will aggregate about 2 million units.

The success in selling appliances attained in the 10 cities selected as demonstration areas under the Gas Industry Development Program is expected to spur other companies to accelerated promotional efforts which will cause national sales to rise toward their potential level.

Replacement of existing gas equipment continues to hold the highest potential for the industry. The study estimates 1,950,000 gas ranges could be replaced under ideal conditions during 1955. An additional 750,000 units could go into new housing and 500,000 units could replace competitive equipment. During the five-year period, 12 million units could be replaced; 4.1 million units sold in new housing; and 2.3 million units could replace competitive ranges.

Potential sales, together with a record of recent actual sales is shown in the accompanying table.

Copies of packaging recommendation available

Printed copies of Simplified Practice Recommendation R254-54, Packaging of Steel Pipe Couplings (Standard and Line Couplings, Black or Galvanized), are now available.

The recommendation, as proposed by the standard packaging sub-committee of the AGA, has been considered by manufacturers, distributors, users, and others interested, and approved for promulgation, effective Sept. 1, 1954. It establishes a simplified list of standard quantities per unit package for steel pipe couplings (standard and line couplings, black or galvanized) ranging in size from ⅛ in. to 2 in.

Printed copies of Simplified Practice Recommendation R254-54 may be obtained from the Superintendent of Documents,

SALES OF GAS RANGES (in Thousands of Units)
(See story above)

	New Housing	Replacement of Gas Equipment	Replacement of Competitive Equipment	Total
Potentials—				
—1955	750	1,950	500	3,200
—1955-59	4,100	12,000	2,300	18,400
If no improvements are made in product design and promotional efforts, sales will be:				
—1955	700	1,300	400	2,400
—1955-59	3,500	6,300	1,700	11,500
Actual sales—				
—1954 (est.)				2,000
—1953				2,180
—1950-54				11,740
—1949-53				11,850

Government Printing Office, Washington 25, D. C., or from any of the department's field offices, for 5 cents a copy. A discount of 25% will be allowed on orders of 100 or more copies.

Southern Union's program modernizes schools

In the course of its four-year existence, Southern Union Gas Co's modernization program has furnished the means for modern home economics equipment and teaching methods in more than 53 of New Mexico's public and private schools. The company provides the newest, most modern gas ranges—installed, serviced, and demonstrated in the schools completely free of charge.

Home Ec teachers are being spared the embarrassment of demonstrating modern methods of cooking on out-dated ranges as fast as the gas company can introduce its modernization program. By November of this year, Southern Union had placed 125 gas ranges in New Mexico schools. The agreement between the schools and the company is in effect for five-year periods, assuring the classes of the most modern cooking fuel, equipment and methods.

The gas company's home economists visit the schools and discuss with teachers,

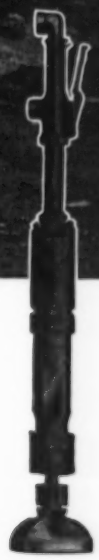
Gas flame lights the way to successful campaign of the Honolulu Community Chest. The Honolulu Gas Co. contrived this tremendous "luau" torch to call attention to annual drive for funds in the Pacific metropolis. In the rear is the famed statue of King Kamehameha I, who knit the Islands together. The flame will be kept burning in front of the Judicial Building on Honolulu's main thoroughfare for the duration of the campaign. Harold Hale of the company's distribution department is shown at lower right.

DAVEY ··· TODAY'S BEST COMPRESSOR AND TOOL INVESTMENTS!

Davey Model 210 Super Chief

From the standpoint of original investment—and reduced operating costs—
you get more for your money with Daveys.

DAVEY MULTI-PORT VALVES require less engine power and less fuel . . . never carbon or foul . . . assure constant full volume of air, keep tools operating at top efficiency. And, they're only one of many features of today's fine Davey lightweight, heavy-duty compressors in 60-125-160-210-315-500-600 c.f.m. sizes.



Davey Backfill Tampers, 35 and 45 lb. sizes

DAVEY AIR TOOLS are designed to meet today's needs! They're streamlined . . . perfectly balanced . . . easier to handle . . . hard-hitting with extra high penetrating power. And, because they offer maximum parts interchangeability, they greatly reduce maintenance and repair expense.

Davey Rock Drills, 4 sizes 28 to 58 lbs.

For complete details, see your nearest Davey distributor!

Davey Paving Breakers 4 sizes—35 to 90 lbs.

DAVEY pioneers of "air-cooled air"

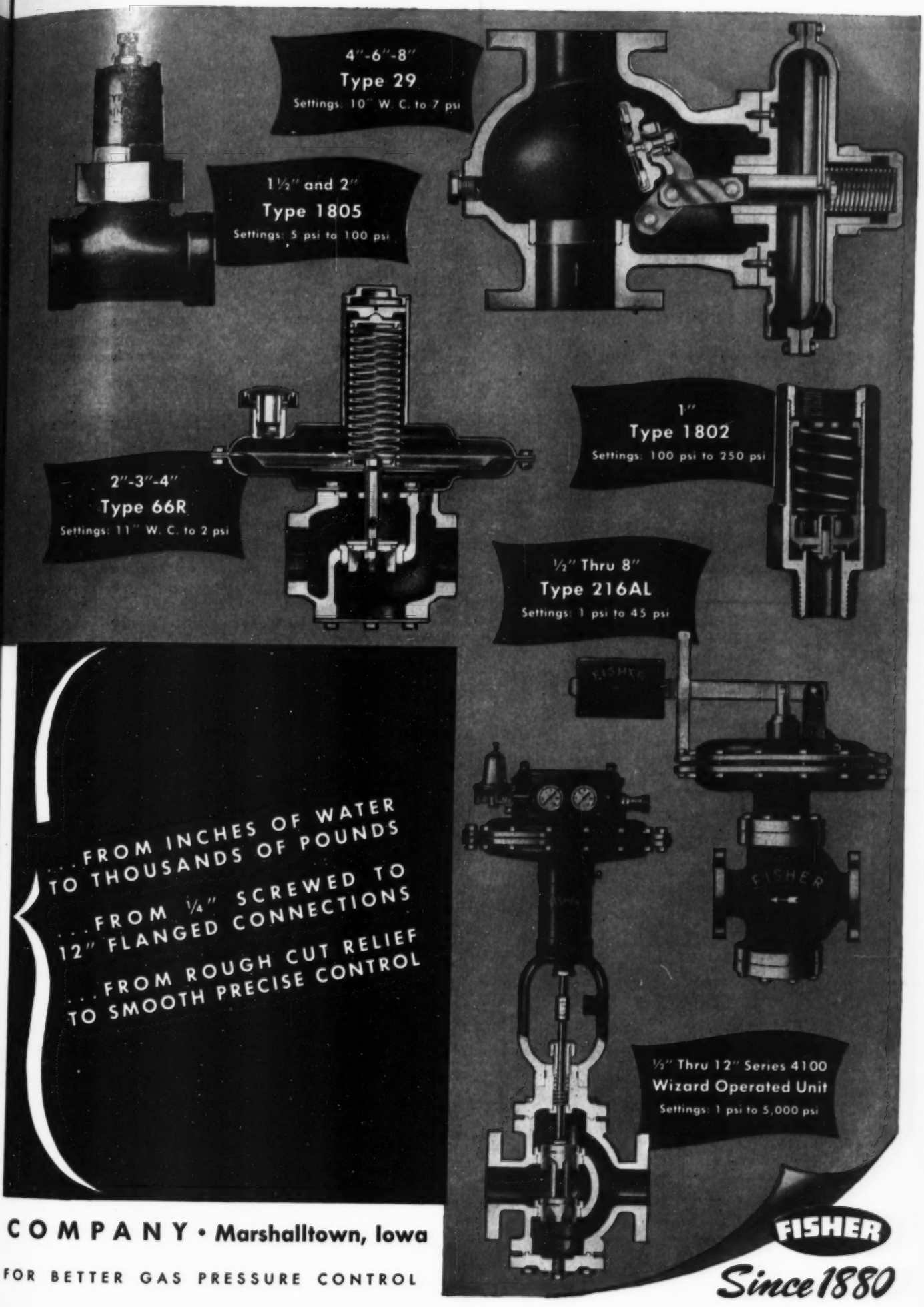
A-9254

DAVEY COMPRESSOR CO.
KENT, OHIO

The Only *Complete Line* of Relief and Back Pressure Valves for The Gas Industry

FISHER GOVERNOR

LEADS THE INDUSTRY IN RESEARCH



. . . FROM INCHES OF WATER TO THOUSANDS OF POUNDS

. . . FROM ¼" SCREWED TO 12" FLANGED CONNECTIONS

. . . FROM ROUGH CUT RELIEF TO SMOOTH PRECISE CONTROL

COMPANY • Marshalltown, Iowa

FOR BETTER GAS PRESSURE CONTROL

FISHER

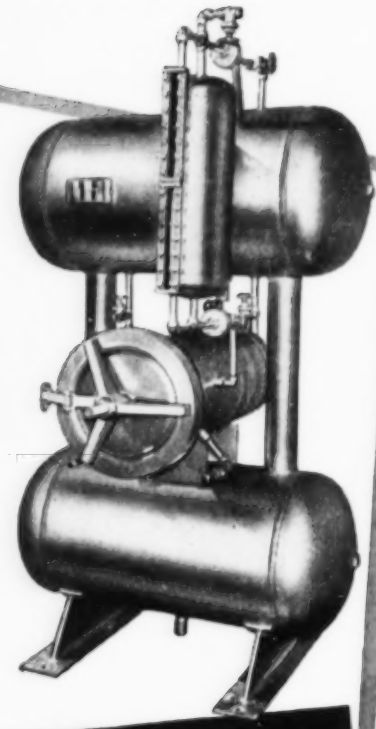
Since 1880

PEERLESS

Type "MP"

ODORIZER UNIT with SILLERS FLEX RING CLOSURE

The Peerless Type "MP" Odorization Unit has been designed to provide a complete odorization setup which is easily installed. This odorizer utilizes the Patented Peerless principle of liquid odorant injection.



LOOK AT THESE ADVANTAGES . . .

- Accurate proportioning of odorant into line.
- Safety tank built in. Cannot flood.
- Leakage is eliminated since all welded piping and packless valves are used.
- It occupies a minimum of space. Only one foundation needed.
- A minimum of piping is required for installation.
- Installation time is reduced.
- Maintaining odorizer is quite simple. Odorizer mechanism easily accessible.
- Positive seal of odorizer housing with Sillers Flex Ring Closure.

Write for Bulletin 904 & 905

Peerless Type "MP" Odorizers have many more outstanding advantages, all engineered to give you the most accurate odorizer available.

PEERLESS MANUFACTURING CO.

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REPRESENTATIVES IN ALL PRINCIPAL CITIES

MECHANICAL JOINT ACCESSORIES

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Strong — Corrosion Resistant — Light Weight — Sizes 2" thru 12"

High Strength Cast Iron Tee Head Bolts and Nuts

Write for Information and Prices to:

CADILLAC CAST PARTS CO.

Subsidiary of

Cadillac Malleable Iron Co.

Cadillac, Michigan

principals, and superintendents the type and installation of equipment necessary to do the modernization job. This information is then passed on to the company's town plant manager and sales department.

Usually, the school's food laboratory is remodeled, so that it becomes a one-or several-unit kitchen. After the installation, Southern Union home economists visit the classes. In a one-hour period, films devoted to kitchen planning, cooking techniques and gas company operations are shown. A cooking and baking demonstration is then followed by discussion.

The University of New Mexico at Albuquerque, and Eastern University of New Mexico at Portales are among the New Mexico colleges now taking advantage of Southern Union's school modernization program.

Misuse of faulty appliances blamed in deaths

The use of side-arm gas water heaters as space heaters is under fire in New York following the 16th death from accidental gas poisoning. Most of the deaths were attributable to misuse of faulty appliances.

A voluntary city-wide search for household hazards is underway by parents and children. Teachers in all schools distributed checks lists, prepared by the Greater New York Safety Council, calling attention to 20 kinds of unsafe conditions and habits most often found in homes.

In Dallas, city officials began an investigation into the death of 10 persons who had been killed by fumes from a faulty gas water heater, which had been used to heat an apartment.

Glass Fibers figures in unification plan

A plan for uniting the Fiber Glass and Corrulux divisions of Libbey-Owens-Ford Glass Co. and the business and assets of Glass Fibers Inc. into a new organization to be known as Glass Fibers Corp. has been revealed. The plan will be submitted to the shareholders of Glass Fibers for approval at an early date.

The new company will have five manufacturing plants in four states with more than 1500 employees and a potential production capacity of $25 million annually.

IGT elects two to serve on board of trustees

Two new members were named to the board of trustees of the Institute of Gas Technology, Chicago, and seven others were reelected for three-year terms during the institute's 13th annual meeting.

The new trustees are Robert Hornby, executive vice president of Pacific Lighting

Gas Supply Co., Los Angeles, and George Naff, president of the Texas Eastern Transmission Corp., Shreveport.

The following trustees whose terms expire this year were reelected: F. M. Banks, president, Southern California Gas Co., Los Angeles; E. J. Boothby; president, Washington (D. C.) Gas Light Co.; James D. Cunningham, president, Republic Flow Meters Co., Chicago; E. H. Eacker, president, Boston, (Mass.) Consolidated Gas Co.; James F. Oates Jr., chairman of the board, Peoples Gas Light and Coke Co., Chicago; J. H. Wolfe, vice president, Consolidated Gas Electric Light and Power Co., Baltimore; and G. S. Young, Columbia Gas Systems Inc., New York City.

Maine rates must be based on replacement value

For the second time, the Maine Supreme Court has ruled that utility rates in the state must be based on current replacement value of a company's property, less depreciation, rather than upon original investments.

The court holds that rate increases granted Central Maine Power Co. last year were not high enough and would have to be refigured by the state PUC. This stand was the same as the court took in January 1953 when it upset the commission's ruling on telephone rates.

Although "current valuation" in fixing utility rates has been thrown out in federal legislation and by other states, the court said, it remains the law in Maine.

Escalator clause approved by Virginia commission

Virginia's corporation commission has approved the plan of seven state gas companies to use escalator clauses in their rate schedules (see November GAS, page 78). It was expected that an appeal would be made by objecting local governments.

In approving inclusion of the clauses, the commission called for a 10-day notice of intent to raise rates so that commission auditors might check the financial status of the company seeking the increase.

Opponents of the plan had argued that the escalator clause would mean that the SCC was abdicating its authority to the FPC.

Grayson's Long Beach plant completed

Construction work at the new $3 million Long Beach, Calif. plant of Grayson Controls division of Robertshaw-Fulton Controls Co. was scheduled for completion early in November. Much of the precision machinery and other equipment will be transferred from the present outgrown Grayson plant in Lynwood, Calif. The new plant, double the size of the present facilities, is

THE NORMAC

BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME, SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

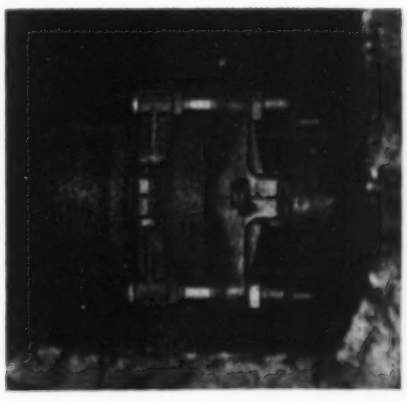
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

scheduled to begin operations in January 1955.

The modern, 237,000-sq ft plant will eventually house approximately 2400 employees in the manufacture of thermostats for gas water heaters and for space heaters, and other Robertson-Fulton products presently produced at Lynwood. The new plant is the first to be located in the new southern California industrial development known as Rancho San Pedro.

The three buildings that comprise the plant are of concrete tilt-up construction with metal deck roofing and structural steel framing.

Gas utility and gas appliance leaders join with University of Southern California educators in inaugurating an eight-week course in salesmanship for gas and gas appliance salesmen. It's the first of its kind in the west. Left to right: J. E. Kern, assistant manager, PCGA; Prof. Charles Whitlo and Dean Carl Hancey, USC; J. F. Ray, chairman, manufacturers section, PCGA; Henry B. Safford Jr., advertising manager, General Controls Co., Glendale; and William E. Joost, assistant sales manager, Day & Night Division, Affiliated Gas Equipment Inc., Monrovia.

CALORIC
GAS DISPOSER

FOR GARBAGE AND TRASH—ODORLESS . . . SMOKELESS!

The new Caloric Double-Duty Automatic Gas Disposer puts an end to messy, smelly, unsanitary garbage cans. And to all the flies, cleaning, scouring and other problems involved.

The housewife just wraps garbage, drops it in the disposer. Caloric and gas do the rest!

The Caloric Disposer gets rid of trash, newspapers, magazines, paper cartons, old shoes and clothes, bones, eggshells, flowers, anything and everything . . . except glass or metal. Operates for just pennies a day. No water or sewage connections required! Install Caloric Disposers wherever a suitable flue is available.

EXCLUSIVE CALORIC FEATURES

CALOR-A-TRED . . . Step on the Calor-A-Tred pedal. Up goes the loading door. Even with both arms full, it's easy and convenient to load.

CALOR-A-SET . . . Calor-A-Set control at "normal" dehydrates any load. But for extra large loads of wet refuse, set at "wet" and for extra large loads of dry refuse, set at "dry".

THERMO-JET-PORCELAIN LINING for dehydration chamber developed specially for exhausts of jet aircraft.

APPROVED BY AMERICAN GAS ASSOCIATION TESTING LABORATORIES

CALORIC

CALORIC STOVE CORPORATION, TOPTON, PA.

Please send me complete data on the new Caloric Double-Duty Automatic Gas Disposer.

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Natural gas sales in September reach new high

Total sales to ultimate consumers during September amounted to 3886 million therms, equivalent to an increase of 5.4% over total sales of 3686 million in September 1953. Gains of approximately 8.0% in industrial gas sales were primarily responsible for the increase in utility gas sales.

Utility and pipeline sales of natural gas to ultimate consumers in September totaled 3705 million therms, a record figure for natural gas sales during that month, representing a gain of 5.6% over the same month last year. Sales of manufactured and mixed gas increased 2.3% to about 181 million therms.

During the 12 months ending Sept. 30, utility and pipeline sales of gas aggregated 59,466 million therms, up 6.2% over the 55,978 million sold in the preceding 12-month period.

Natural gas sales were up 6.6%, reaching 56,242 million therms, while manufactured and mixed gas sales showed a slight decrease.

Lone Star strengthens Wichita Falls system

Lone Star Gas Co. has reactivated its North Beverly street measuring station and laid more than 26,400 ft of new 2- and 4-in. main pipe as a part of its current program to strengthen gas supply service for Wichita Falls. The company has extended new mains and service lines to around 1000 new custo-

mers in Wichita Falls since last January.

Since purchase of the former United Gas system property, Lone Star has been working to combine the two underground distribution systems. Some of the old United and Lone Star lines throughout the city are parallel and will be combined by retaining the lines that are in the best condition. Where larger pipe is required, new line will be laid and both old lines removed.

Reactivation of the measuring station allows natural gas to flow into the Wichita Falls distribution system from three directions. By operating three stations, the company can maintain a complete circulation of gas throughout the city although all stations receive their supply from the company's 18-in. transmission line coming in from Petrolia.

All three measuring stations are operated by a remote control system from the company's service center.

Hydrostatic test used by Consumers on new line

First water pressure or hydrostatic test ever made by Consumers Power Co., Jackson, Mich., was performed recently on a new section of line. Previously, the company had used gas pressure.

Before the test, the line was blown clean of any dirt, water, tools, or other foreign matter by inserting a rubber cup and wire brush pigging appartus in the line and driving it through by gas pressure.

Then the new line was filled with 350,000 gal. of water pumped at a pressure of from 635 to 685 psi. A rubber-cupped squeegee was inserted, keeping a solid wall of water behind it as it pushed the air in the line in front of it.

After the hydrostatic test, gas pressure was applied to another squeegee for 24 hours to remove any water left. The gas line was completely dry after the squeegee passed through twice.

Winners in refrigerator sales campaign announced

Nineteen winning companies of the AGA-Servel gas refrigerator sales campaign were announced at the annual AGA convention.

Southern California Gas Co., Los Angeles, operating in Division 1, had most points over quota and received $5834 in prize money in the "On Our Way" campaign.

Other Division 1 winners were Southern Counties Gas Co., Los Angeles; The Peoples Gas Light & Coke, Chicago; and Southern Union Gas Co., Dallas.

Division 2 quota toppers were Roanoke (Va.) Gas Co.; United Gas Corp., Monroe, La.; Mobile (Ala.) Gas Service Corp.; Central Indiana Gas Co., Muncie; Metropolitan Utilities District Gas Dept., Omaha; Savannah (Ga.) Gas Co.; Peoples Water & Gas Co., North Miami, Fla.; Chattanooga (Tenn.) Gas Co.; Central Illinois Light Co.,

● drives anywhere at 12.6 m.p.h.

● digs main lines and laterals

● undercuts walks, curbs, old mains

● makes vertical set-in —saves hand work

● backfills its own trench

Rubber-tired TRENCHMOBILE saves a lot of time and costly hand labor on utility trenching. Its 12.6 m.p.h. "drive-anywhere" mobility steps up work schedules on scattered, small-yardage jobs . . . ideal for house-to-curb service connections, pipe reclamation, trouble-shooting. Trenchmobile also fits requirements for main line excavations. It opens trenches 8 to 16 inches wide, 5 feet deep . . . digs up to 14½ ft. per min.

There's little or no hand clean-up because Trenchmobile undercuts sidewalks, old mains . . . makes vertical set-ins flush with foundations . . . backfills its own trench (blade optional). Get all the details. See Parsons distributor, or write us.

(Also: 5 large crawler-type models).

to: PARSONS COMPANY, Newton, Iowa

Send bulletin on 43.6 HP Model 88 Trenchmobile

NAME _____

TITLE _____

COMPANY _____

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CITY _____

P362REV.GAS

PARSONS (Koehring Subsidiary) *Trenchmobile*

Springfield; Mid South Gas Co., Little Rock; Jacksonville (Fla.) Gas Corp.; and South Jersey Gas Co., Atlantic City.

Division 3 titlists were Union Gas System Inc., Independence, Kan.; Central Florida Gas Corp., Winter Haven, Fla.; and Central Illinois Electric & Gas Co., Freeport.

New gas refrigeration method subject of research

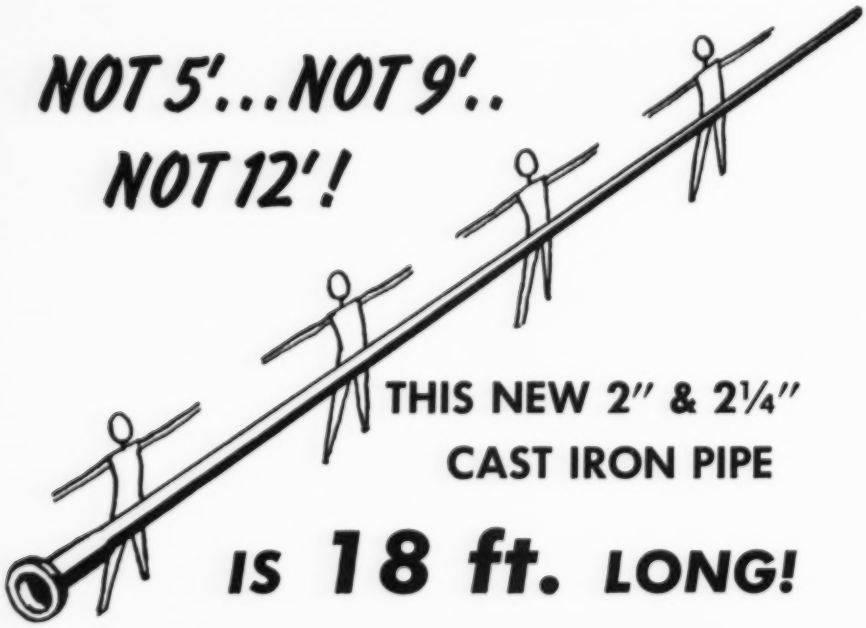
At the present time, the A. O. Smith Corp. is devoting full-time attention to the development of a new type of gas refrigeration and has already allocated several hundreds of thousand of dollars for this purpose, although the ultimate cost of the research cannot be accurately predicted.

In totaling up the amount it has spent since 1927 on research, engineering, development and actual production facilities devoted to the interests of the gas industry, the company found that the total exceeds $30 million.

In a 12-page report sent to 37θ AGA members plus officers of all leading gas utilities, it was pointed out that A. O. Smith's latest research is in the direction of gas-fired air conditioning.

In addition to the utilization end of the industry, the company has made a major contribution to the fabrication of the nation's network of natural gas transmission lines.

NOT 5'...NOT 9'..
NOT 12'!



THIS NEW 2" & 2¼"
CAST IRON PIPE
IS 18 ft. LONG!

McWANE-PACIFIC SUPER DeLAVAUD
CAST CENTRIFUGALLY

The fastest laying Small Diameter Cast Iron Pipe in the United States! Every time you make a joint, you've laid 18-feet of pipe line. Easy to handle by two men. Lay it on skids over the trench, make the joint and snake the line into the ditch. Beautiful centrifugal castings, true circles in diameter, straight as a rifle barrel, even metal thickness, easy to tap. Furnished uncoated, coated or cement lined, with complete line of fittings, bell-and-spigot or Boltite Mechanical Joint. For complete information, write or wire McWANE CAST IRON PIPE COMPANY, Birmingham, Alabama, or PACIFIC STATES CAST IRON PIPE COMPANY, Provo, Utah. (Sales offices in principal cities.)

McWANE PACIFIC PIPE Lasts for Centuries

News Notes

The 11th edition of "Petroleum Facts and Figures" has been issued by the American Petroleum Institute. The 322-page book tabulates statistics of every phase of the oil industry for the years 1949-1953.

The Montana Power Co., Butte, last month took over operations of natural gas properties in the Great Falls-Havre area from Montana-Dakota Utilities Co. The transfer affects 5500 direct customers and 12,400 indirect customers served by the Great Falls and Shelby companies.

Noburn Sales Co., Kansas City, Mo., has been appointed manufacturers representative for the states of Nebraska, Kansas, and western Missouri by the Titan Valve & Manufacturing Co., Cleveland. Ontor Laboratory Ltd., Toronto, Canada, has been appointed as exclusive manufacturers representative in Canada.

Servel Inc. has appointed National Airco Co. Inc., Baltimore, as Servel air conditioning distributor for seven counties in northern Maryland.

At the recent election, Colorado voters approved a state constitutional amendment bringing all privately owned utilities under the jurisdiction of the State Public Utilities Commission. Designed to eliminate jurisdictional controversy between home-rule cities and the state commission over control of utility rates, the amendment is similar to one rejected at the 1952 general election. Defeat of the proposal in that year had been attributed to misunderstanding on the part of the electorate.

Industrial Crane & Hoist Corp. has moved into new and enlarged office and plant facilities at 1536 S. Paulina St., Chicago. With the 160,000 sq ft of space now available and with installation of considerable new machinery and equipment, the company has more than doubled manufacturing capacity for its expanded line of cranes.

Consumers Distributing Co. Inc., Baltimore, has been appointed distributor for Servel gas and electrical appliances. The territory served by the company includes 17 counties in northern and eastern Maryland, two counties in southern Delaware, and one county in eastern Virginia.

General American Transportation Corp., Chicago, has signed a contract, with a half-million dollar rights payment, with the Societe Europenne de Revetement Chimique (S. A.) licensing that company exclusively to use and to sub-license General American's Kanigen plating process in several countries and territories abroad. The society, a new company to be known as Seurec, is composed of 10 French industrial firms.

National Safety Council honors AGA for service

The National Safety Council has presented to the American Gas Association a "National Award of Merit for Exceptional Public Service in the Prevention of Home Accidents During the Year 1953-1954." The program that led to this recognition was aimed at safe space heating in America's motels, tourist courts, and cabins.

The award was bestowed in recognition of the work done in a joint program by the American Gas Association and the American Automobile Association to eliminate accidents in transient facilities resulting from improper use and installations of unvented room heaters. The American Automobile Association was asked to refuse the use of its symbol of approval unless the room heater installations complied with the recommended code developed by the AGA. Training schools were established for the field reporters of AAA so that they could recognize proper installations and guide the owners of tourist facilities in correcting existing systems.

After January 1954, non-standard systems were no longer acceptable to AAA and all renewals as well as new applications for the use of the AAA symbol had to show that their equipment met the established standards prescribed by the two national associations. During this program more than 34,000 room heaters in 2000 establishments were replaced by approved equipment. Furthermore, several states have enacted legislation requiring all owners of such facilities to follow essentially the same requirements.

AGA opposes leasing of communications equipment

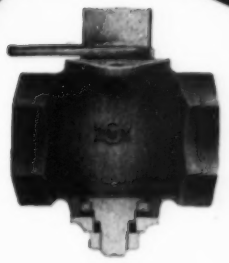
The communications committee of the American Gas Association is opposed to the leasing of radio communications equipment and maintenance services from communications common carriers on private frequencies assigned by the Federal Communications Commission to the Petroleum and Power Radio Service.

In a resolution, which was approved by the managing committee of the AGA operating section and the AGA board of directors, the association's communications committee expressed disapproval of efforts of the common carriers to persuade private users to lease equipment and services from them. The AGA is fearful that such a trend might influence the commission to limit the frequency allocations of private systems.

The AGA communications committee resolution declares the gas industry should make known to the common carriers and to other interested parties the reasons why it is essential to the gas industry's continued operations that the present system of private

IT PAYS TO BUY HAYS that are TOPS

7405
Iron Body, Galvanized,
Bronze Plug Stop



7490
"Key-Lok" Tamper Proof Stop
Lockwing—Iron Body,
Bronze Plug

7500
Threadless Gas Stop
Iron Body, Brass Plug

Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

Iron Body with Brass Plug
Black or Galvanized
Also All Brass Stops

Flat Head—Flat Head with Lockwing

Full Range of Sizes

Quality Assured . . .
By Precision Machining—
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Quality Proven . . .
By Supplying the Gas Industry
for Over 80 Years

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Space Saving Storage . . . Another HAYS First

Write for literature, or ask "The Man from Hays"

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HAYS MANUFACTURING CO.
ERIE, PA.

communications be continued. Such service should be continued and maintained in those vital and special areas where private systems are best suited to gas industry requirements, the communications committee believes.

AGA service bureau issues first books in series

The educational service bureau of the American Gas Association has published the first two books in a series of six booklets designed to show the application of scientific principles to the construction and operation of a gas appliance.

The books were prepared by Elbert C. Weaver, educational advisor, who will prepare the remaining four booklets in the series. The new booklets are titled "Science Principles and Your Automatic Gas Range" and "Science Principles and Your Automatic Cloth Dryer." Intended for classroom and laboratory use in junior and senior high schools, the titles are self-explanatory. The booklets describe various features of these gas appliances and the scientific principle behind the design, construction and operation of each feature.

The 1955 AGA home service committee met at AGA headquarters in New York recently with Katherine L. Rathbone, home service supervisor of the Southern Counties Gas Co., Los Angeles, presiding as chairman. Projects for the year will include the Home Service Workshop at the Drake hotel in Chicago, Jan. 24-26, 1955, a revision of the booklet "Home Service on the Job," and a study of the public relations features of home service work in connection with sales promotion.

Lancaster S-7 GROOVE TYPE METAL RIM DIAPHRAGM

Performance advantages of the Lancaster S-7 mean a closer to 100% overall accuracy — and an extra margin of profit. Patented Lancaster features and superior quality construction add up to more years of service in the meter — and another margin of extra profit.

If you are not using the Lancaster S-7 groove type metal rim diaphragm for your small meter repairs and replacements, write for a sample today.

Lancaster METER PARTS CO.

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Association Notes

Paul B. Rutledge, coordinator of employee activities, Michigan-Wisconsin Pipe Line Co., Detroit, has been elected chairman of the American Gas Association Midwest personnel conference. Other officers of the conference, elected for one-year terms, are: Armond Harris, administrative assistant, Northern Natural Gas Co., Omaha, vice chairman, and P. S. Hopkins, personnel director, Metropolitan Utilities District, Omaha, secretary

Lawrence R. Auldridge, former overnight editor with the International News Service at Washington, D. C., has joined the public information bureau of the AGA. He replaces David F. Grozier, who has joined Bozell & Jacobs Inc.

Among new directors elected by the board of directors of the American Petroleum Institute is Paul Kayser, El Paso Natural Gas Co. Elections were held last month during the association's 34th annual meeting in Chicago.

People

Promotions

J. A. Millen

Jay Davis

Southern Counties

JAY DAVIS JR. and J. A. MILLEN have been elected vice presidents of Southern Counties Gas Co., Los Angeles. Mr. Davis will be in charge of gas system construction and distribution, building construction and maintenance, and technical and engineering services. Mr. Millen will head the company's transmission and compression system and will represent the company in gas supply and purchase matters.

LEO A. MAYO, director of methods for the Connecticut Light & Power Co., Berlin, Conn., has been elected controller of the company. TRAVER L. BERRY becomes assistant controller.

H. DONALD BORGER, vice president, has been elected executive vice president of the Peoples Natural Gas Co., Pittsburgh.

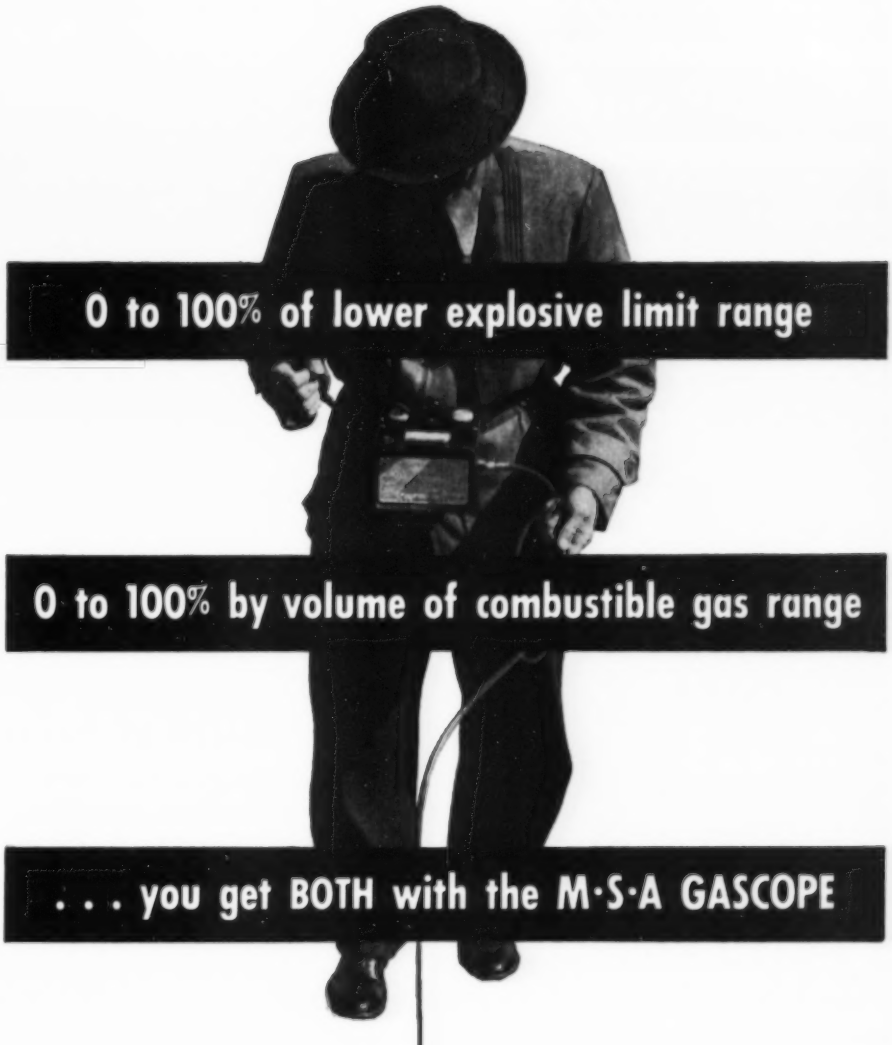
H. D. Borger

Peoples Natural

A. S. Morgan

UGI

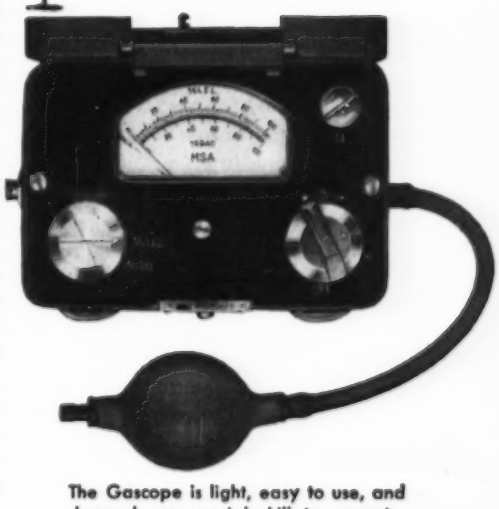
Organizational changes in three of its divisions have been announced by United Gas Improvement Co., Philadelphia. They will become effective Jan. 1, 1955. J. A. FRICK, who is retiring, will be succeeded by A. S. MORGAN as vice president in charge of the Lehigh Valley Gas division. J. L. HARRISON will succeed Mr. Morgan as general manager of the Lancaster County Gas division and W. R. BOLLENDORF JR. will be advanced to the position of operating manager at Harrisburg Gas division, succeeding Mr. Harrison. R. L. YEAGER will be transferred from Philadelphia to Harrisburg. The company also announces that H. S. RAND will succeed S. A. TOLLEFSON, who is retir-



This dual-range, direct reading instrument, controlled by the simple turn of one selector switch, gives you accurate, quick gas detection over the entire range from 0 to 100% by volume. And no air dilution accessories are required.

The story of this new simplicity, new adaptability is told by the control panel in the picture at the right. The range from 0 to 100% gas concentration is covered in two scales. When gas is detected above the LEL range, a turn of the switch transfers the indication to the higher 0 to 100% gas concentration scale.

This unit is the modern answer to fast, dependable detection and location of gas leaks. Write for details, or ask for a demonstration. Your request will be handled promptly.



The Gascope is light, easy to use, and demands no special skill to operate.

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At Your Service: 76 Branch Offices in the United States
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Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors... eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.

No. 790 GREENLEE PUSHER For 3/4 to 4-inch pipe. Six speeds—5,600 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.

POWER PUMP For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

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Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1952 Columbia Avenue, Rockford, Illinois, U.S.A.

ing. Mr. Rand will be in charge of personnel records, labor relations, insurance and claims.

GEN. E. E. JEFFE has been elected president and director of New York & Richmond Gas Co., succeeding JOHN KOHOUT, who has retired. New directors are A. LEE LOOMIS, HARRY E. GOULD, and FRANCIS S. LEVIEN.

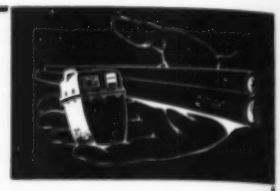
CEC Instruments Inc., Pasadena, Calif., has opened a Buffalo (N. Y.) district office to serve New York, northwestern Pennsylvania, and Ontario and Quebec, Canada. EUGENE J. MOSCARET is in charge of the new office. The company has also promoted PHILLIP A. WILNER to the post of manager of the Detroit district office.

Recent promotions at B. C. Electric Co., Vancouver, B. C., include THOMAS INGLEDOW, vice president and executive engineer; DR. HARRY L. PURDY, executive vice president; JACK H. STEELE, chief engineer; and JOHN R. P. POWELL, executive assistant to Dr. Purdy.

FRANK SULLIVAN has been named director of public relations for the Southern California Gas Co., Los Angeles. F. A. MCCANLIES, assistant vice president for the company, becomes assistant director of public relations.

Promotions in the Hudson division gas department of the Public Service Electric & Gas Co., Newark, include: IRWIN S. WEBSTER, engineer of distribution; GERHARD A.

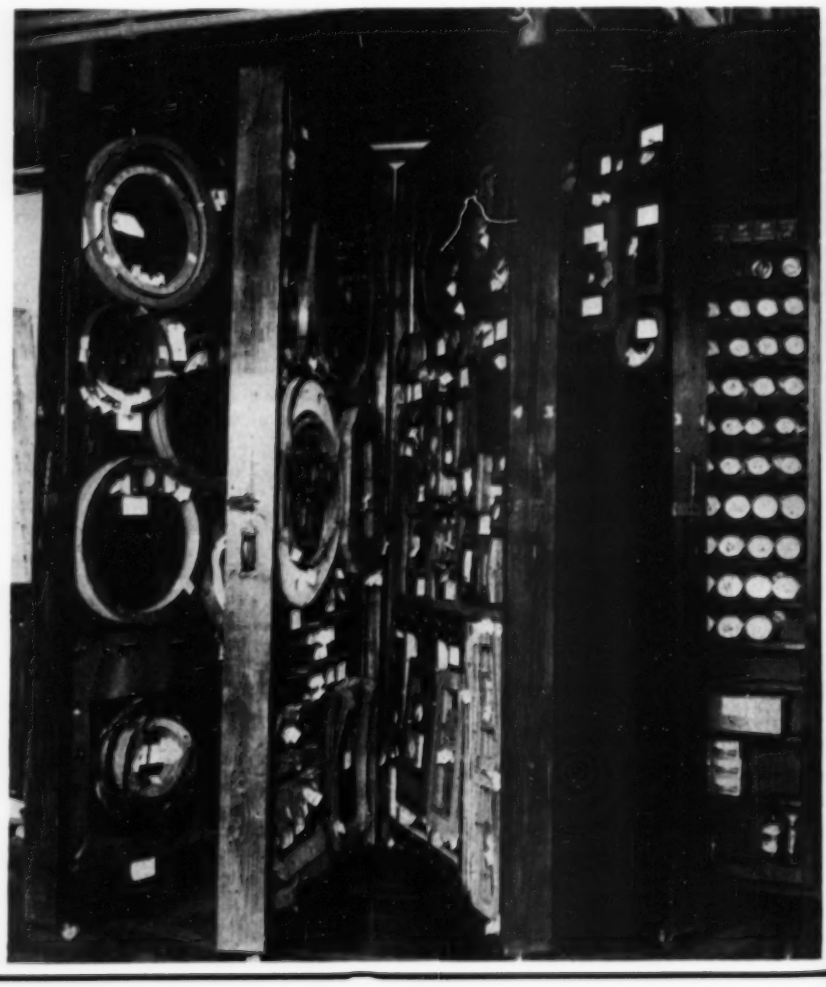
SHORT CUTS IN MATERIALS HANDLING: **5**



Gasket board

Transcontinental Gas Pipe Line Corp. solved the serious problem of attempting to identify and store gaskets and other small items by building this gasket board. Each panel board, which is constructed of plywood, rolls on the wheels that are visible in the bottom of the photo.

AGA materials handling subcommittee



Manufactured under Consolidated Edison Co. of N. Y., Inc. Patent No. 2,342,045. Application development assistance by Public Service Electric and Gas Company of New Jersey

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PRECISION REPAIRS ON MACHINES CUT TIME AND EFFECT SAVINGS!

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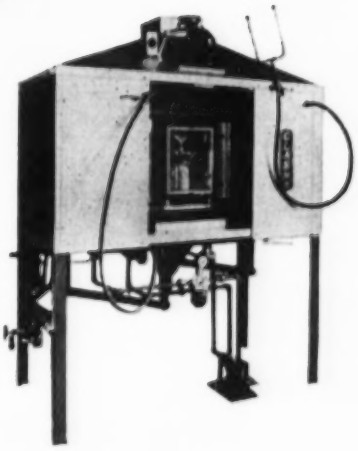
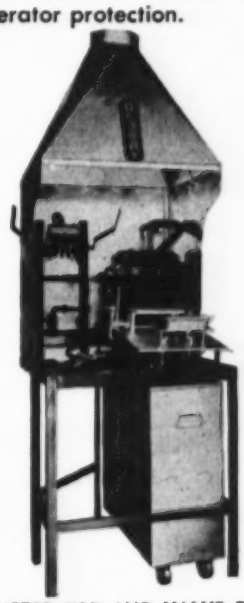
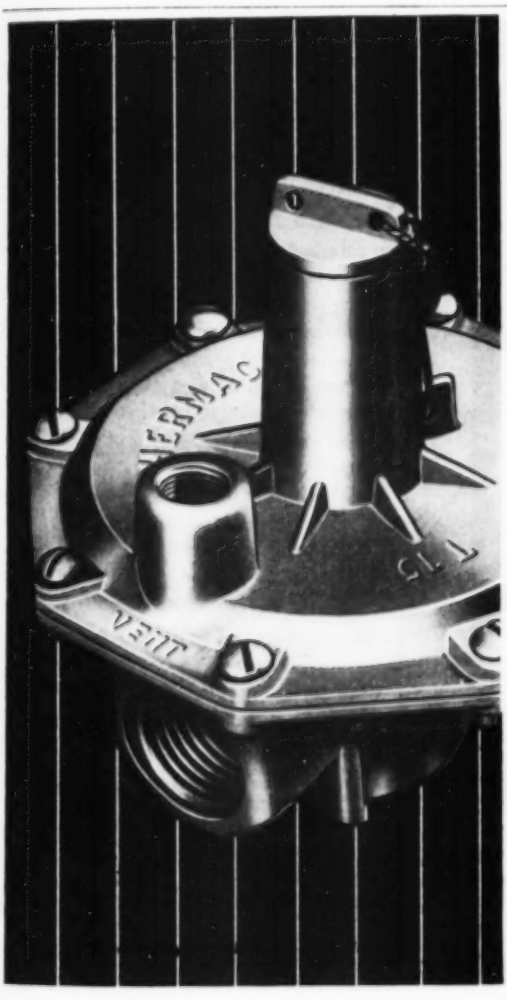
and reduce repair time to a minimum. Front and Back Machine and Top and Valve Box Machine both available in 5 and 10 light meter capacity and adjustable to most makes of meters. They feature approved safety devices for operator protection.



METER FRONT AND BACK REMOVING MACHINE



METER TOP AND VALVE BOX COVER REMOVING MACHINE



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SMALL SIZE — LARGER CAPACITY is the chief reason for the unprecedented demand for Thermac pressure regulators.

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This high capacity, low restriction manual main gas shut-off valve, when used with Thermac regulators, provides an unusually low cost assembly.

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A new concept in Unit Heaters — *new* inside and out. Stimulating styling that sells . . . plus more engineering achievements that surpass all others. Efficiency and rugged construction for the toughest heating task. Top flight quality to suit even the most conservative buyer has established the name —Peerless—that has been counted on for dependability for 70 years.

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FIVE SIZES IN EACH TYPE

60,000 BTU — 80,000 BTU

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Rectorseal holds even the most potent odorants. It never hardens, crumbles, cracks or gets brittle.

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a Knott Hotel

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ATlantic 1-6970

BITTNER, assistant engineer of distribution; and EDWARD J. BODNER, superintendent of distribution for the north Hudson district.

FRED R. PALIN has been promoted to assistant general manager of the Union Gas Co. of Canada Ltd., Chatham.

VINCENT J. WALSH, formerly executive assistant to the secretary, has been elected secretary of the Philadelphia (Pa.) Electric Co.

MARVIN CHANDLER has been elected president of Northern Illinois Gas Co., Chicago, succeeding H. P. SEDWICK, who was named vice chairman. E. D. SHEEHAN is now assistant vice president; GEORGE W. RYERSON is secretary; and STEPHEN E. TAYLOR is assistant secretary.

Commonwealth Edison Co. of Chicago has named WILLIAM H. COLWELL and LEROY J. CLARK assistant secretaries; W. WARREN GURRIER has been put in charge of the stock transfer department.

LAWRENCE E. MACDONALD has been named general sales manager for Bucyrus-Erie Co., S. Milwaukee. He has been with the company for more than 28 years.

GORDON HENTZ has succeeded INWOOD SMITH as manager of marketing of the RCA Estate Appliance Corp., Hamilton, Ohio. THOMAS BARTLEY has been named manager of field promotion in the department.

F. J. YOUNG JR. has been named plastic pipe specialist in the sales forces of the Republic Supply Co. of California, Los Angeles.

DONALD B. VAIL has been elected vice president of Commonwealth Services Inc., New York.

NORMAN LIEBLICH, formerly general sales manager and chief applications engineer, has been promoted to the post of vice president of Kieley & Mueller Inc., Middletown, N. Y.

As the first step in reorganizing its Midwestern sales setup, the meter and valve division of Rockwell Manufacturing Co. has promoted CARL K. MADISON to vice president in charge of new product sales for the

C. K. Madison

W. R. McLaughlin

Rockwell

entire division. The Midwestern sales region has been divided into the Southwestern region, with W. R. McLAUGHLIN, Dallas, as regional manager, and a smaller Midwestern region with ROY R. BUSH, Tulsa, as manager.

R. R. Bush
Rockwell

D. C. McDermand
Hamilton

D. C. McDERMAND, formerly regional manager of the greater New York area, has been promoted to the post of sales promotion manager of Hamilton Manufacturing Co.'s home appliance division.

THOMAS DEBEVOISE, formerly supervisor of inventory control, has been appointed assistant manager of the eastern division of the Peoples Natural Gas Co., Pittsburgh.

Lone Star Gas Co., Dallas, has made three appointments to coordinate sales and promotional work throughout the company's system. J. M. LYNN JR. is now general sales and promotion manager for the Dallas division; ARDMORE HEALY holds the same position in Fort Worth; and JOHN PERRYMAN heads sales and promotion in Abilene. Lone Star has also announced the promotion of GEORGE F. PECK to superintendent of all distribution properties in Oklahoma.

EDWARD H. SMOKER, vice president in charge of operations for United Gas Improvement Co., Philadelphia, will succeed WALTER E. LONG as president on Dec. 31.

As assistant to R. A. Bautts, manager of operations, HAMILTON MOSES JR. will organize and direct safety and personnel training programs for MidSouth Gas Co., Little Rock.

ALLAN J. CAMPBELL has been named sales engineer in the eastern division of the Canadian Meter Co.

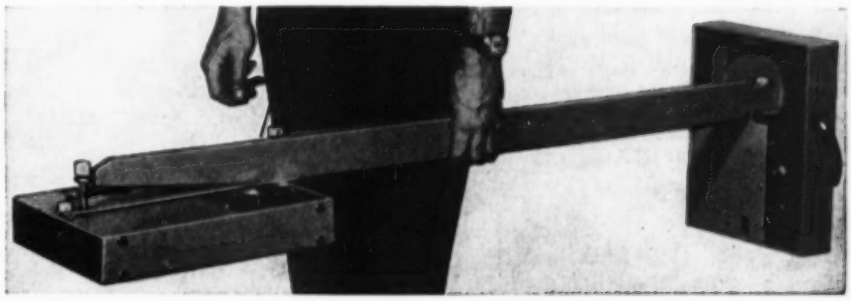
Laclede Gas Co., St. Louis, has appointed ALLEN H. BURGESS to the post of vice president in charge of operations; R. J. VANDAGRIFF, vice president in charge of sales; E. L. RAMSEY, vice president in charge of industrial relations; and JOHN J. McKEARIN, sales manager.

Transfers

MARSHAL G. COOK, formerly of the Phillips Petroleum Co., has joined the R. W. Stafford Co., Chicago.

THE WILKINSON LINE LOCATOR

A precision instrument for detecting the position and depth of any sub-surface pipe, cable, stub, valve, coupling, etc.



The dependability of the Wilkinson Line Locator is amply attested by its wide use. Leading gas, oil and pipe line companies generally KNOW its value.

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New HINGED PIPE CUTTER
You can cut off 8" pipe, in
less than 5 minutes
send for free literature on these amazing cutters for standard steel and cast iron pipe from 2½" to 12".

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Without obligation, please send me descriptive literature on your new hinged pipe cutters.
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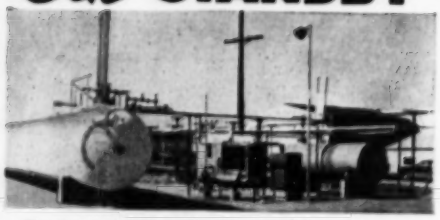

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A Packaged Draketown Propane Plant will help you reduce demand charges; provide a supply of gas during curtailment periods.. at the turn of a valve... or supply that outlying section or plant 100% if desired.

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If you have a gas problem, we can help you. We operate from coast to coast and overseas.

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For low-cost general light trenching. Self-contained, operates under its own power. Digs clean, even trenches to 36" depth. Lightweight, mobile, low operating and maintenance costs. Easily transported from job to job. Several models.

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NEW MODEL "ELECTRONIC WITCH"

ONE MAN OPERATION

SUPERIOR OPERATION

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WANTED

Commercial Gas Sales Engineer— Manufactured gas utility in Far West desires services of commercial and industrial gas sales engineer. Age 28-40 preferred and engineering degree required. Applications strictly confidential. Salary commensurate with background and experience. Box 115, GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

ROY E. JONES has rejoined the North Shore Gas Co., Waukegan, Ill., as vice president. Since 1951 he has been executive vice president of Peoples Water & Gas Co. and Peoples Gas Co., N. Miami, Fla.

HANS U. LIEBERHERR has been named director of engineering; EMIL GRIESHABER, director of projects development; and RALPH MILLER, consultant and director of Supair-thermal development and application of Nordberg Manufacturing Co., Milwaukee.

J. B. GRIFFITH has been appointed assistant to J. F. Ray, vice president in charge of sales for General Controls Co., Glendale, Calif. He was formerly manager of purchases for the Day & Night division of Affiliated Gas Equipment.

EWALD F. KLOER, former vice president and general manager at the Lake Shore Gas Co., Ashtabula, Ohio, has been appointed assistant to the president of the Worcester (Mass.) Gas Light Co.

New faces

ALAN L. SMITH, formerly with the New York Telephone Co., has been appointed publicity supervisor at the Brooklyn (N. Y.) Union Gas Co.

FRANK P. DE LARZELERE has joined the Akin Gasoline Co., Tulsa. Well known in the petroleum field, Mr. De Larzelere will be in charge of the L. P. gas division of the company.

LEONARD R. SPARROLD has joined the Maxitrol Co., Detroit, as test engineer on the company's product development and research staff.

BERT H. MCGILL has joined Eclipse Fuel Engineering Co. of Canada Ltd., Toronto, as president and general manager.

WILLIAM G. MCDANIEL, formerly a sales engineer in Houston, has been appointed manager of the Corpus Christi branch office by the Foxboro (Mass.) Co. He succeeds W. A. ROCK, who recently joined the Foxboro representative in Mexico.

Deaths

WALTER DIETMEYER, division service superintendent of North Shore Gas Co., Waukegan, Ill., died in October after a two-month illness. He had been with the company for more than 25 years.

THOMAS HOLMES SYKES, 51, president and chairman of the board of the Suffolk (Va.) Gas Corp., died recently. A veteran of 29 years in the gas industry, Mr. Sykes was also owner and president of the Nansemond Gas Corp., an L. P. gas company.

CURRENT READING

PURGING PRINCIPLES AND PRACTICE—This book, prepared by the purging committee of the AGA under the chairmanship of G. R. King, covers such subjects as factors affecting the mechanical nature of purging; supervision, personnel, and planning; isolation; sources of ignition; vent pipes; testing instruments and apparatus; and testing methods for control of purging.

The book includes 220 pages of text, charts, tables, illustrations, graphs, and bibliographies.

Prices are: AGA members, $5 per copy ($4 each in lots of 10 or more); non-members, $6 per copy ($5 each in lots of 10 or more); students, $4 per copy.

Orders or inquiries should be sent to order department, AGA, 420 Lexington Ave., New York 17.

GUIDE TO EQUIPMENT USING HEAT IN CHEMICAL PROCESSING—Information Letter No. 60, prepared by the AGA chemical processing subcommittee, has been designed to assist industrial gas engineers in their contacts with chemical plants.

TITANIUM—Information Letter No. 62 prepared by a subcommittee of the AGA commercial and industrial gas section. The letter briefly describes the production, properties, advantages and limitations of this strong, light metal for which there is a growing demand in high speed aricraft production and in uses requiring extreme resistance to corrosion.

INERT GAS GENERATORS FOR CHEMICAL PROCESSING—Information Letter 64 prepared by a subcommittee of the AGA industrial and commercial gas section. The letter describes atmosphere generators used for chemical processing, where practically all of the atmospheres are inert.

ACCIDENT PREVENTERS—Illustrations and sound tips on how to stay safe on the job are contained in this new employee training leaflet from the National Safety Council. A pocket-size library on safe principles and practices on lifting, housekeeping, clothing and hand tools, the booklet may be distributed at safety meetings, passed out by foreman, enclosed in pay envelopes, or made available for pick up at the time clock.

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DRYING PROCESSES AND ASSOCIATED INDUSTRIES—Information Letter No. 65 issued by the industrial processing committee of the AGA industrial and commercial gas section. The letter lists all types of drying operations as obtained from an industry-wide survey.

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CALENDAR

December

3..Panhandle Plains Regional Meeting NGAA — Herring Hotel, Amarillo, Texas.

3..NEGA Gas Utility Sales Managers Conference — Hampshire House, Boston.

6-7..SGA Advisory Council and Management Conference — Point Clear, Ala.

6-8..AGA-EEI Electronics Seminar — Hotel Commodore, New York.

7..NEGA Appliance Servicing Conference — Hotel Statler, Boston.

8-10..Eastern Computers Conference (AIEE, IRE, ACM) — Bellevue-Stratford Hotel, Philadelphia.

8..NEGA Gas Utility Managers Conference — Sheraton-Plaza, Boston.

1955

January

13-14..NEGA Accounting Division—Hotel Statler, Boston.

17-19..7th Annual Convention, Pipe Line Contractors Association —Statler Hotel, Los Angeles.

18..NEGA Operating Division—Hotel Statler, Boston.

21..SGA Employee Relations Roundtable — Nashville.

24..SGA Air Conditioning Sales Conference — Adolphus Hotel, Dallas.

24-26..AGA Home Service Workshop—Drake Hotel, Chicago.

26-28..Instrumentation for the Process Industries Symposium—Texas A&M College, College Station, Texas.

27-28..Fourth Annual Instrument Short Course (Southern California Meter Association) Los Angeles Harbor Junior College, Wilmington, Calif.

27..NEGA Accounting Division—Hotel Statler, Boston.

28..SGA Accident Prevention Roundtable—Heidelberg Hotel, Jackson, Miss.

28..SGA Air Conditioning Sales Conference—Heidelberg Hotel, Jackson, Miss.

28..Pennsylvania Gas Association, Mid-Winter Sales Conference—Benjamin Franklin Hotel, Philadelphia.

February

4..SGA Work on Consumers' Premises Conference — Biltmore Hotel, Oklahoma City.

11..NEGA Manufacturer - Distributor Division — Hampshire House, Boston.

13-15..24th Annual Mid-Winter Conference of Public Utility Buyers' Group, National Association of Purchasing Agents — Shamrock Hotel, Houston.

23-24..PCGA Seminar on Electronic Data Processing — Los Angeles.

25..NGAA Permian Basin Regional Meeting—Scharbauer Hotel, Midland, Texas.

March

4..SGA Transmission Management Conference—Shamrock Hotel, Houston.

7-9..Mid-West Gas Association—St. Paul Hotel, St. Paul, Minn.

7-11..National Association of Corrosion Engineers — Palmer House, Chicago.

9-10..PCGA Customers Service Conference—Carmel, Calif.

16-17..PCGA Home Service Conference—Santa Monica, Calif.

23-24..PCGA Accident Prevention Conference—Santa Barbara.

24-25..NEGA Annual Meeting — Hotel Statler, Boston.

24-25..Oklahoma Utilities Association Convention — Mayo Hotel, Tulsa.

April

28-1..Western Metals Congress and Exposition—Los Angeles.

12-14..AGA Sales Conference on Industrial & Commercial Gas —Hotel Statler, Boston.

12-15..AGA Distribution, Motor Vehicles & Corrosion Conference — Netherland Plaza, Cincinnati.

18-19..AGA Residential Gas Section, Eastern Natural Gas Regional Sales Conference—Hotel William Penn, Pittsburgh.

19-21..Southwestern Gas Measurement Short Course—University of Oklahoma, Norman.

20-22..Indiana Gas Association Annual Meeting — French Lick Springs Hotel, French Lick, Ind.

25-27..National Conference of Electric and Gas Utility Accountants — Conrad Hilton Hotel, Chicago.

25-27..Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

Western Pennsylvania to get 1350 MMcf per day this winter

NATURAL gas utilities in western Pennsylvania expect to deliver an average of 1350 MMcf of gas daily during the 1954-55 heating season (Oct. 1-April 30), the Pennsylvania Natural Gas Men's Association announced. This is nearly 7½% greater than actual average daily deliveries of 1250 MMcf in the 1953-54 winter period.

On the coldest winter day, however, gas load forecasters expect natural gas deliveries to total approximately 2300 MMcf, up 350 MMcf from last winter's peak of 1950 MMcf. The difference is accounted for mainly by the fact that 80,000 additional homes and commercial buildings are using natural gas for space heating this winter—630,000 of 975,000 customers in 1954-55 vs. 550,000 of 950,000 in 1953-54.

Underground gas storage reserves will be more essential than ever in meeting this winter's larger natural gas requirement, PNGMA reported. The association also emphasized that both the total volume of natural gas in storage and the amount which can be withdrawn to meet a sudden, sharp cold spell are at a record high, assuring that the industry can supply demands well in excess of the indicated daily and peak volumes.

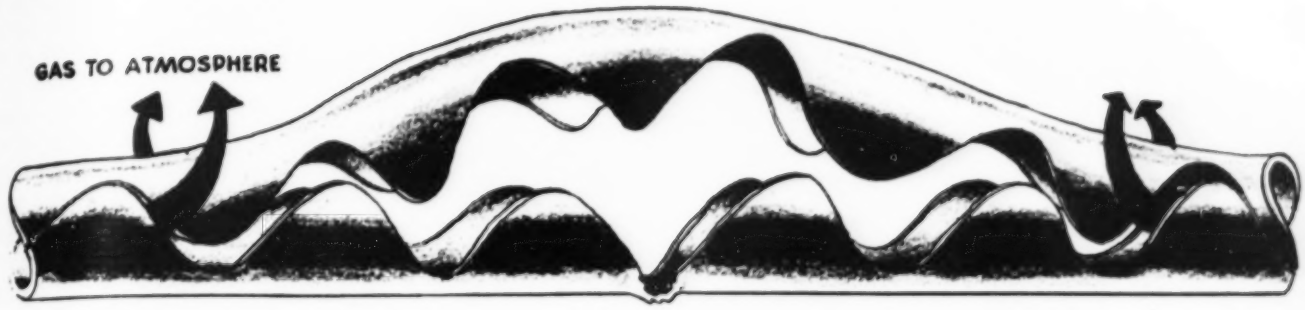
Of the expected total average daily delivery, gas dispatchers estimate that 16%, or 200 MMcf, will be supplied from underground storage reserves. In other terms, storage will supply the gas used to heat one in every three homes and commercial buildings using gas for space heating.

To supply the predicted peak day delivery, at least 1 billion cu ft will be required from underground storage reserves. By comparison, average daily total gas deliveries for all purposes, including industrial use, were 690 MMcf during the past summer.

Underground gas storage reserves that could be withdrawn for Pennsylvania customers in the 1954-55 winter totaled more than 175 billion cu ft at the start of the heating season, PNGMA reported. This is 25 billion cu ft more than was available last winter.

Estimated maximum volume of gas that can be withdrawn in a single 24-hr period is more than double the anticipated one-billion-foot cold day requirement. (Actual maximum one-day deliverability of a storage pool will vary depending upon the extent and rate of withdrawals prior to the cold-day demand upon the pool.)

PNGMA member company utilities now operate 55 underground gas storage pools—more than any other state. Capital investment and outlays for natural gas inventory in these pools exceeds $125 million and represents a sizable "new" industry in Pennsylvania developed mostly since the end of World War II.



Artist's conception of the break caused by the hydrogen blister in a 24-in. line of El Paso Natural Gas Co.

HYDROGEN BLISTERS ...

Their causes and methods of prevention

By FELIPE PAREDES and W. W. MIZE, Senior Engineers
El Paso (Texas) Natural Gas Co.

IN 1950 El Paso Natural Gas Co. constructed a 24-in. trunk line with 16-in. and 8-in. laterals from the Barker Dome field in southern Colorado and northern New Mexico to a natural gas treating plant in Fruitland, N. M. The gas contained 15 mole percent carbon dioxide and 1 mole percent hydrogen sulfide. The line operated well for several months and then a series of breaks began.

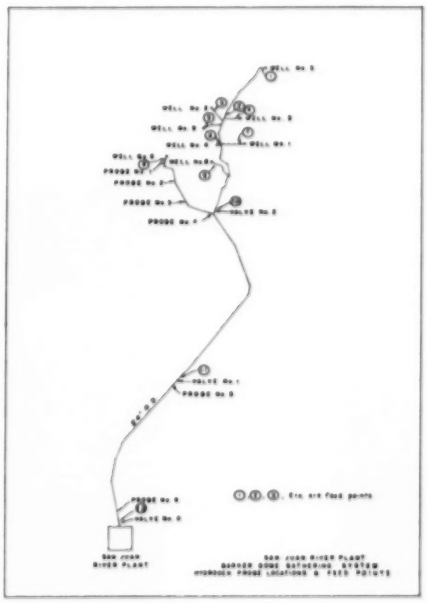
The first break on the 24-in. line occurred on Oct. 27, 1951, and another occurred four days later. The first break on the 16-in. lateral occurred on Dec. 13, 1951. During December and January there were two breaks on the 24-in. line and five breaks on the 16-in. lateral (see *Figs. 1 and 2*). It was decided that metal separations in the pipe wall were the cause of the line failures.

Based on reports[1] of similar blisters found in oil refinery vessels, the company decided to investigate the possibility of hydrogen blisters being the cause. Hydrogen activity probes were inserted in the lines to test this theory. The points at which the probing was done are shown on the map.

A cutaway section of a probe[2] is illustrated in *Fig. 3*. If hydrogen attacks the steel it will probably go through the thin wall section of the probe and find an artificial cavity or metal separation at the annulus of the rod. Gas collected in the annulus would bleed off through a vent hole in the rod and out through a capillary tube to a pressure gauge.

Fig. 4 shows the probe installed. An indication of pressure was observed in three probes on the same day. Gas from a blister was analyzed and found to be 94% hydrogen and 2% methane, with traces of carbon dioxide and carbon monoxide. It was obvious that hydrogen blisters caused the failures.

To find the source of hydrogen, gas from each well in the Barker Dome field was analyzed for hydrogen and other contaminants. Only one well showed a high content of hydrogen, 0.2 mole percent. On the basis of the analyses, it was evident that corrosion on the internal walls of the pipe was the source of hydrogen.



Breaks occurred along this line. Note points where hydrogen activity probes were inserted.

Because of the success of an organic inhibitor in combating corrosion and tubing failures in the wells at Barker Dome, the same organic inhibitor was injected into the line on April 22. One quart of inhibitor per 4 MMcf of gas was used. On May 17, the last indication of pressure was recorded on the first probe below the point of injection. As the inhibitor traveled down the line, the probes stopped indicating pressure, showing that corrosion was evidently being inhibited. There have been other breaks on the system since the inhibitor was injected, but these were caused by the damage already in the pipe.

Description of the breaks

Most of the breaks originated in the failure of a blister and most blisters broke toward the inside of the pipe against the gas pressure. In all breaks the pipe ripped in two places, 180° apart, usually at 3 and 9 o'clock. The breaks continued in this position and unraveled at the end as shown in *Figs. 5* and *6*. The breaks followed a sinusoidal curve *(Fig. 7)*. The pattern of the rips was not disturbed by the presence of the welds. On one occasion a severed

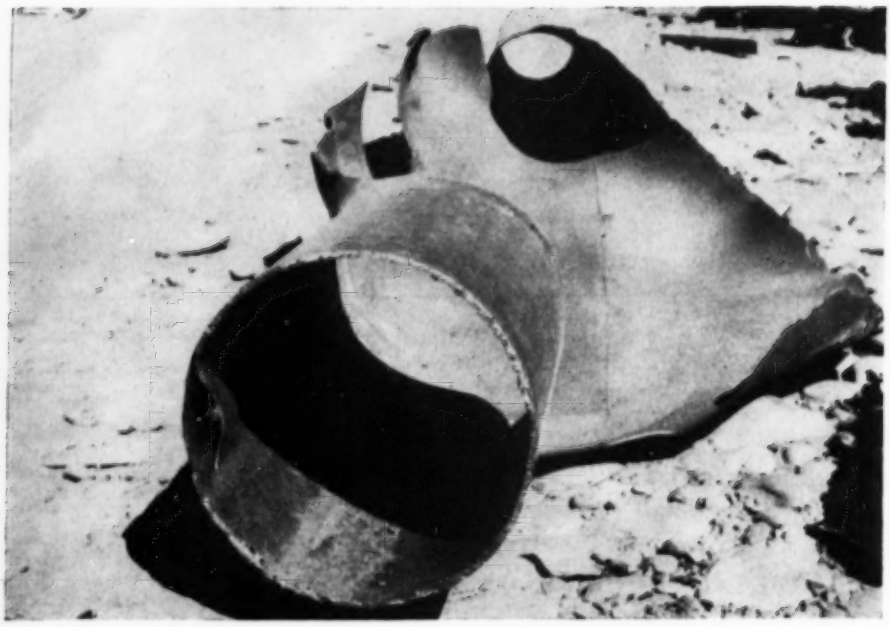


Fig. 1. One of the first breaks on the 16-in. lateral.

section of the pipe was carried 200 ft away. The symmetry of the curve was broken only when the rip went through blisters (see *Fig. 8*).

It was not difficult to determine the origin of the breaks since a peculiar cleavage fracture appeared on the wall of the pipe as shown by *Fig. 9*. The herringbone pattern pointed toward the origin of the break.

The rate of fracture is not known. In tests run by Battelle Memorial Institute, the rate of crack propagation has been estimated as high as 4100 ft per second. The break apparently follows a shock wave front with the characteristics of a brittle fracture. Fractures have been observed to travel many inches ahead of the visual break. Battelle is studying the characteristics of these breaks.

Many instances of hydrogen attack on low carbon steel are known[3]. Most of these have occurred in refinery vessels carrying exceedingly corrosive solutions at high temperatures. Apparently, this was the first experience of hydrogen blistering in gas transmission lines.

Corrosion is a source of atomic hydrogen. Hydrogen sulfide and carbon dioxide gases dissolve in water to form dilute acid solutions which attack iron according to the equation at the bottom of the column.

A breakdown of this formula shows what takes place in the anode and the cathode of the corrosion cell, respectively:

$$2Fe + 2HAc \rightarrow 2FeAc + H_2$$

(iron + (weak acid) → (salts of the iron) + (molecular hydrogen)

$$Fe^{\circ} \rightarrow Fe^{++} + 2e$$
$$2H^{+} + 2e \rightarrow 2H^{\circ}$$
$$2H^{\circ} \rightarrow H_2$$

In the presence of catalyst, atomic hydrogen will not combine to form molecular hydrogen, and it is this atomic hydrogen that is readily absorbed by the steel.[4] The catalyst is H_2S and FeS. Hydrogen blistering is the result of atomic hydrogen penetration[5] and the conversion of atomic hydrogen to molecular hydrogen at internal discontinuities within the steel.[6] The amount of corrosion necessary to have an adequate supply of atomic hydrogen for hydrogen blistering is not known.

The refinery industry observed the following conditions necessary for hydrogen blisters[7]:

1. A steel surface subject to corrosion.
2. A source of reactive hydrogen.
3. A liquid water phase.
4. An agent capable of poisoning steel surface so that the formation of molecular hydrogen from atomic hydrogen is retarded.
5. Gross imperfections in the steel, such as a slag inclusion, a void, a discontinuity, or minute imperfections such as rifts within single crystals.
6. A promoter which maintains an active surface.

The steel surface subject to corrosion was the pipeline. Hydrogen sulfide and carbon dioxide in the gas caused corrosion, which is the source of reactive hydrogen. The liquid water phase was the condensed moisture in the gas. Hydrogen sulfide was the poisoning agent which retarded the formation of molecular hydrogen. By virtue of the method of rolling and cooling, the steel plate offered the gross imperfections and discontinuity necessary for hydrogen blisters. Hydrogen sulfide is the promoter

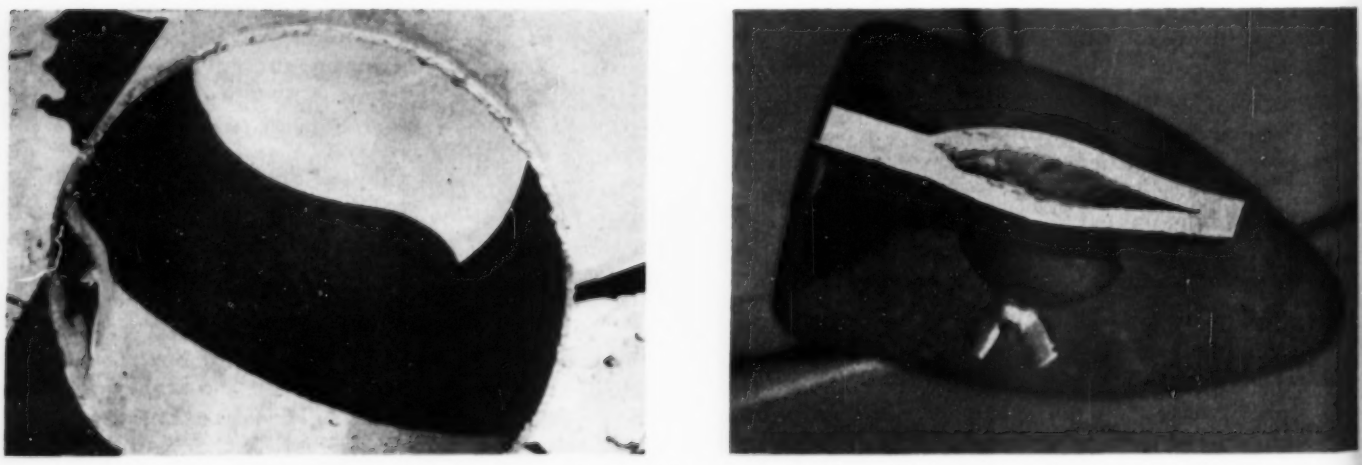


Fig. 2. Close-ups of blisters. Largest distance between laminations is ½ in. Note flaky and stringy condition of steel inside blister.

that maintains an active steel surface for the absorption of atomic hydrogen.[8] Most of the breaks originated on the lower portion of the line where there is a higher concentration of water. Lower temperatures during winter months increased the amount of condensation.

High concentration of atomic hydrogen on the surface of the steel and a steel surface that can prevent the combination of atoms to molecules of hydrogen gas are conditions necessary for hydrogen penetration. The rate of diffusion of hydrogen through steel depends on:

Condition of the steel. Highly stressed such as cold-worked or improperly annealed welded steel shows greater diffusion rates than lower stressed steel.

Low pH. High penetration rates are found in low pH systems and decrease as the pH increases.

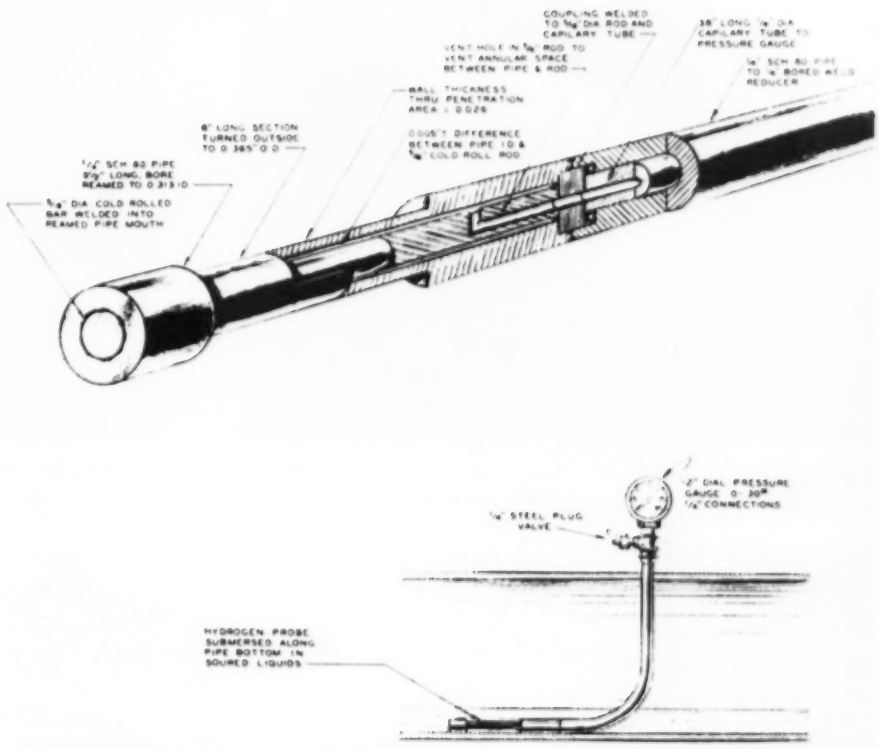
Presence of a poisoning agent. Laboratory experiments show that the presence of cyanide increases the rate of penetration, and it decreases as the cyanide concentration decreases.

Temperature and pressure. The solubility of hydrogen increases with temperature and is proportional to the square root of the partial pressure of hydrogen.[9]

Austinetic or ferritic steel. Austinetic steels dissolve hydrogen four or five times faster than pure iron or low-alloy ferritic steels.

Preventive Methods

An organic inhibitor forms a tightly adherent absorbed film on metal surfaces, perhaps 1 or 2 molecules thick. This film will adhere to the surface of the metal by forces of chemical union forming a closely packed barrier to the migration of corroding agent molecules.


COUPLING WELDED TO ⅜" DIA ROD AND CAPILLARY TUBE
VENT HOLE IN ⅜" ROD TO VENT ANNULAR SPACE BETWEEN PIPE & ROD
WALL THICKNESS THRU PENETRATION AREA = 0.026
8" LONG SECTION TURNED OUTSIDE TO 0.365" O.D.
½" SCH 80 PIPE
⅜" LONG BORE REAMED TO 0.313 I.D.
⅜" DIA COLD ROLLED BAR WELDED INTO REAMED PIPE MOUTH
DIGIT DIFFERENCE BETWEEN PIPE I.D. & ⅜" COLD ROLL ROD
38" LONG ⅛" DIA CAPILLARY TUBE TO PRESSURE GAUGE
¾" SCH 80 PIPE TO ¼" BORED WELD REDUCER
2" DIAL PRESSURE GAUGE 0-30# ¼" CONNECTIONS
¼" STEEL PLUG VALVE
HYDROGEN PROBE SUBMERSED ALONG PIPE BOTTOM IN SOURED LIQUIDS

Cutaway view of probe used to determine the presence of hydrogen.

On the line at Barker Dome, the organic inhibitor prevented the hydrogen sulfide and water from attacking the steel.

Alter the surface of the steel. Precoating or lining with alloys of chromium and molybdenum or by the use of austinetic steels which have been found to be satisfactory at all temperatures and pressures.

Polysulfide injection. Laboratory experiments and experience in petroleum refinery plants have shown that polysulfide will decrease corrosion of low carbon steel and afford a protective film to the steel to prevent hydrogen attack.[10]

Appendix

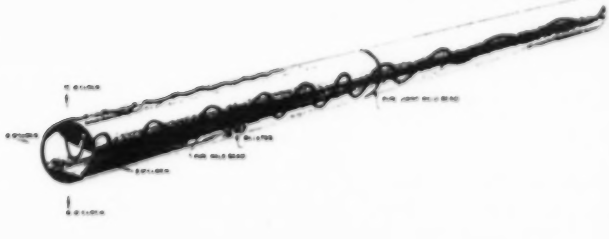
Pipe specifications: 24-in. OD x .271-in. wall, 68.678 lb/ft electric fusion welded blacksteel pipe ends beveled 25° for welding in lengths from 29 ft - 0 in. to 31 ft - 6 in., not less than 27 ft - 0 in. acceptable in accordance with specifications L1, dated 1-1-49.

Pipe manufactured from open hearth steel plates. The inside weld bead is applied, with steel tabs in place, by means of automatic submerged arc welding. Pipe is expanded with an increase in diameter approximately 1.75% to 1.95%; pipe decreases in length approximately 2⅞ in. with a hydraulic pressure approximately 1650 psi.

Hydrostatic test: 24-in. OD x .271-in. wall pipe - 1060 psi. This pressure held for 10 seconds and then reduced

Fig. 4 (left). Hydrogen probe installed.

Fig. 5 (below). Position of breaks in relation to pipe.



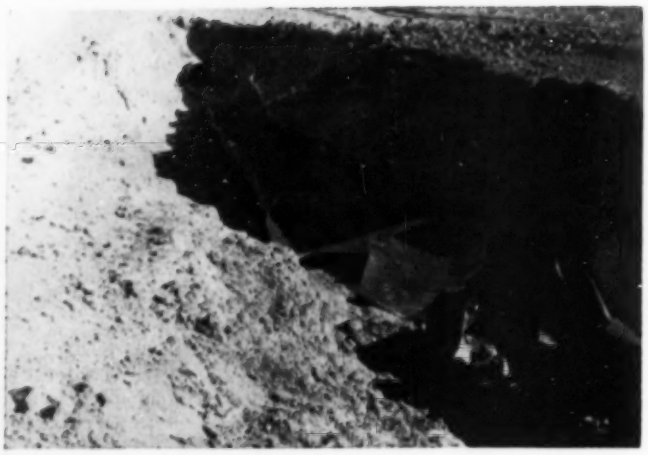


Fig. 6 (left). Early break on 24-in. line, showing effect of explosion on the trench and pipe. Note unraveled pipe at the end of the break. **Fig. 7 (right)** shows the sinusoidal curve of the breaks.

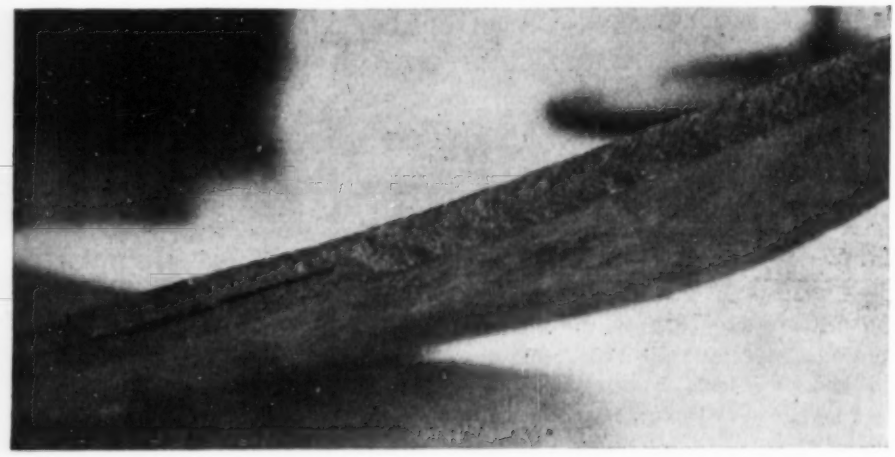


Fig. 9 (above). Herringbone pattern on pipe wall.

Fig. 8 (left). The symmetry of the curve was broken only when the rip went through the blisters.

to 500 psi and visually inspected for leaks.

CHEMICAL ANALYSIS
(24-in. OD x .271-in. wall.)

Ladle Analyses

	Carbon	Manganese	Phosphorus	Sulfur
Maximum	.28	1.00	.049	.046
Minimum	.20	.64	.015	.018
Average	.243	.778	.0265	.0311

Check Analyses

Maximum	.29	1.06	.056	.047
Minimum	.20	.65	.015	.017
Average	.245	.803	.0271	.0315

All check analyses meet specifications L-1, which merely limits the carbon content to 0.30%. All chemical analyses meet with the requirements of API-Std. 5LX.

Tensile tests: As required by specifications L-1, tensile tests were made on specimens cut from one length of pipe made on each heat of steel. Transverse tensile test specimens cut approximately 90° from weld.

TRANSVERSE TEST OF STEEL

	Yield Str. Psi	Tensile Str. Psi	Elong. Percent
Maximum	68,540	94,550	32.5
Minimum	53,280	73,240	23.0
Average	59,438	81,875	29.06

TRANSVERSE TEST ACROSS WELD

Maximum	93,260
Minimum	76.070
Average	84,661

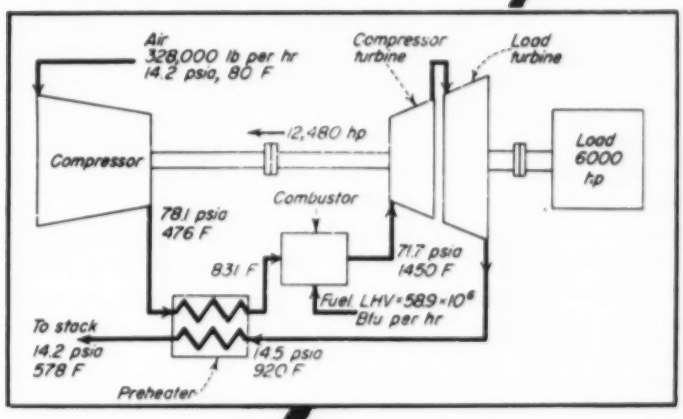
All the tensile tests meet with the requirements of specifications L-1 and also with the requirements of API-Std. 5LX, with respect to minimum transverse yield strength of grade X52 line pipe.

REFERENCES

1 "Hydrogen Attack of Steel in Refinery Equipment," R. T. Effinger, M. L. Renquist, A. Watcher, and J. G. Wilson, May 1, 1951.
2 Ibid., page 20.
3 "Prevention of Hydrogen Attack on Steel in Refinery Equipment," W. A. Bonner, H. D. Burham, J. J. Conradi, and T. Skei, May 1953.
4 "Hydrogen Attack of Steel in Refinery Equipment," R. T. Effinger, M. L. Renquist, A. Watcher, and J. G. Wilson, May 1, 1951, page 2.
5 Ibid., page 2.
6 Ibid., page 3.
7 "Prevention of Hydrogen Attack on Steel in Refinery Equipment," W. A. Bonner, H. D. Burnham, J. J. Conradi, and T. Skei, May 1953, page 4.
8 Ibid., page 4.
9 Ibid., page 6.
10 Ibid., page 9.

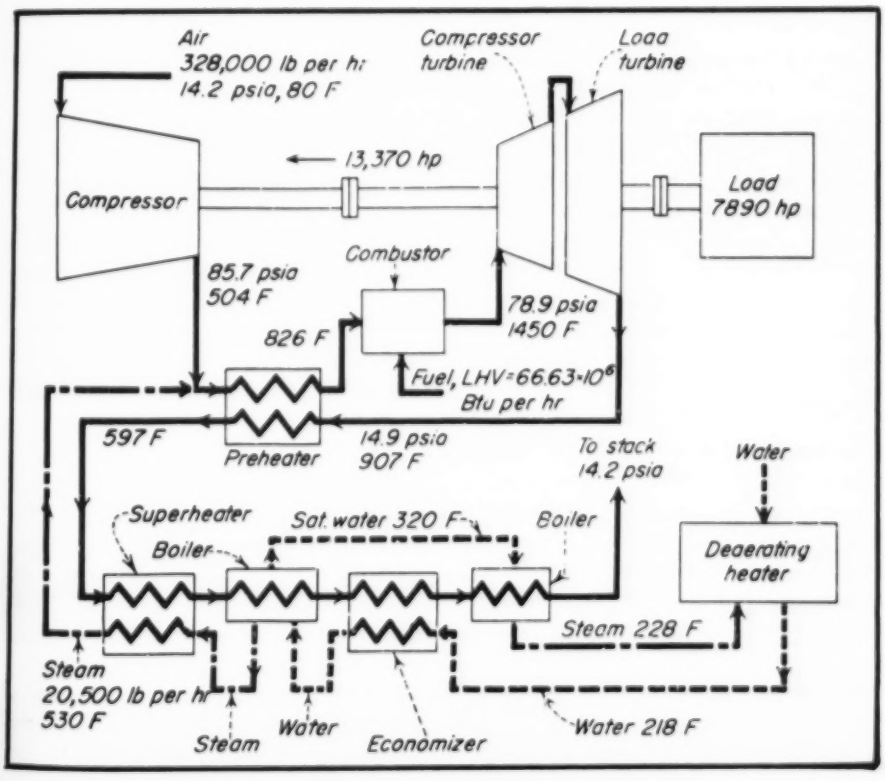
This article has been adapted from a paper presented at the petroleum mechanical engineering conference of the ASME, Sept. 26-29, in Los Angeles.

Will added steam give economical power boost to gas turbines?



By adding steam at the compressor discharge, so that a mixture of air and steam flows through the preheater to the combustor, and using the turbine exhaust to generate and superheat the steam as well as to heat the feedwater, the author believes a gas turbine plant rated 5700 hp at 25% thermal efficiency can have its output increased to 7500 hp at 29% thermal efficiency. A suggested hookup for such a system is shown in Fig. 2 (below), which is an elaboration of the basic conventional plant shown in Fig. 1 (at right).

By BENJAMIN MILLER
Consulting Engineer
Ozone Park, N. Y.



LOWER cost per horsepower for equipment and lower fuel consumption per horsepower-hour generated can be attained by adding steam to the air in the gas-turbine process. To obtain maximum benefits from steam addition requires equipment not yet commercially available, but substantial increases in both capability and thermal efficiency can be achieved by adding steam-generating equipment to gas-turbine power plants now being marketed as well as to some that already have been installed. Naturally, the water needed to generate the steam must be available at reasonable cost.

Output increased

For example, a gas-turbine power plant rated 5700 hp at 25% thermal efficiency can have its output increased to 7500 hp at 29% thermal efficiency by the addition of steam-generating equipment costing considerably less than one-fifth as much as the gas-tur-

This article has been adapted from a talk presented at the semi-annual meeting of the ASME in Pittsburgh, June 20-24.

bine plant. The water requirement is less than 50 gpm.

To show how such improvements in capability and economy can be realized through steam addition, consider the application of this feature to the General Electric one-compressor, two-turbine gas-turbine power plant. This plant has been the subject of several publications that discuss its design features[1], its use for driving centrifugal compressors[2], and its use for driving a generator for central station service[3]. While these publications give the capability of the plant as 5000 hp or 3500 kw under the standard conditions of 80° F and 14.2 psia at the compressor inlet, the manufacturer now publishes[4, 5] revised ratings of 5700 hp or 4000 kw under the same standard conditions.

Conventional gas-turbine

The flow diagram for the plant when operating in the conventional manner is shown in *Fig. 1*. It must be emphasized that the temperatures, pressures, flow rate, and horsepowers shown in *Fig. 1* are my own estimates, since the company has not published a consistent set of data. While I do not have knowledge of specific design or performance data which the company has not published, the numerical values shown in *Fig. 1* are mutually consistent, and are not inconsistent with what the manufacturer has published. In estimating them, considerable weight has been given to published information about the performance of similar components of another gas-turbine power plant[6]. It is, therefore, believed that the figures given are sufficiently accurate for the purpose for which they are used herein, which is to calculate the results to be obtained through steam addition.

It will be noted that the manufacturer's rating is 5% less than the 6000 hp shown in *Fig. 1*, and the guaranteed fuel consumption is 4% higher than the 9818 Btu (LHV) per hphr which we have estimated. Such margins between estimated performance and what may be prudently guaranteed are not unusually large.

Flow diagram with steam addition

The flow diagram for the plant when operating with steam addition is shown in *Fig. 2*. The steam is added to the compressed air at the compressor discharge, so that a mixture of air and steam flows through the preheater to the combustor. The turbine exhaust, which in the conventional operation passes from the preheater directly to the stack, is used in the process shown in *Fig. 2* to generate and superheat the steam, as well as to heat the feedwater.

While the diagram shows the exhaust flowing from the preheater through four elements in series, all four may well be placed within a single casing. Waste-heat boilers which incorporate economizer and superheater sections are in common use. Two boiler sections, operating at different pressures, may be incorporated readily in a single casing; each section is provided with its own steam drum.

The water and steam-flow arrangement shown may be replaced by some

other arrangement if local conditions so dictate. However, it is this arrangement that has been used as the basis for the estimate that the cost of the steam-generating equipment, including equipment for softening and de-aerating the feedwater, would be less than one-fifth the cost of the gas-turbine power plant.

The numerical values shown in *Fig. 2* are based on the addition of 1 volume of steam to each 10 volumes of air. Comparison of these numerical values with the corresponding values shown in *Fig. 1* brings out the similarities and differences between the two processes.

Comparison of processes

As the nozzle flow area of the compressor turbine is fixed, and the nozzle pressure ratio is greater than critical, the actual volume flow rate to the compressor turbine cannot change, and the turbine-inlet pressure must be increased from 71.7 psia to 78.9 psia to allow the plant to use as much air per hour as when operating in the conventional way.

The pressure drop between the compressor discharge and the inlet of the compressor turbine increases in proportion to the increase in mass-flow rate from 6.4 to 6.8 psi, so that the compressor discharge pressure increases from 78.1 psia to 85.7 psia. This makes the temperature at the compressor discharge increase from 476° F to 504° F, and the power put into the air by the compressor increases correspondingly from 12,480 to 13,370 hp.

The exhaust gases suffer a pressure drop in passing through the waste-heat boiler, and their pressure drop through the preheater increases because they are flowing at a higher velocity. The combined effect is to increase the back pressure on the load turbine from 14.5 psia to 14.9 psia.

The pressure ratio across the two turbines in series is thus increased from 71.7/14.5 to 78.9/14.9, while the flow through the turbines is increased by the 20,500 lb per hr of steam. The result of the two increments (in pressure ratio and in material flow) is to increase the available power output of the compressor turbine from 12,480 to 13,370 hp, and to increase the net power output of the load turbine from 6000 to 7890 hp.

It may be mentioned at this point that the sum of the power absorbed in compressing the air and the power absorbed by the load is taken in each case as 97% of the turbine enthalpy drop, while 3% of the turbine enthalpy drop is allowed for heat losses from the plant, bearing friction, the operation of auxiliary equipment, and other miscellaneous losses.

Turbine-exhaust temperature

The temperature drop across the turbines is 530° F in the conventional operation, and in the operation with added steam it is 13° F greater. This change in turbine-exhaust temperature is so small relative to the changes in pressure ratio and enthalpy because the heat capacity of steam is much greater than that of air.

The temperature effectiveness of the preheater is taken as 80% in the process with added steam as well as in the conventional process. (This is equivalent to assuming that the changes in pressure, composition, and velocity of the streams flowing through the preheater increase the heat-transfer rate to about the same extent as they increase the pressure drops. While to make this assumption is not quite correct, the

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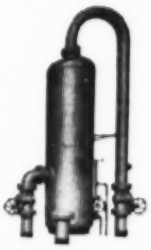

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underestimate in fuel consumption to which it may lead is less than 1%.) With 80% temperature effectiveness, the air is preheated to 831° F in the conventional process while the mixture of air and steam in the other process is preheated only to 826° F.

The combustion efficiency is taken in both processes as 98%: that is, the enthalpy of the combustion products and excess air leaving the combustor in the conventional process exceeds the enthalpy of the preheated air and the fuel by 98% of the lower heating value of the fuel and, similarly, the enthalpy of the combustion products, excess air and added steam leaving the combustor in the other process exceeds the enthalpy of the preheated mixture of air and steam and the fuel by 98% of the lower heating value of the fuel. Thus the fuel flow rate in the process with added steam is about 13% greater than in the conventional process, but the net power output is about 31% greater.

Thec omparison shows that the conventional process produces 6000 hp at a fuel rate of 9818 Btu (LHV) per hphr, while the process with added steam produces 7890 hp at a fuel rate of 8445 Btu (LHV) per hphr.

Considering the commercial rating of the General Electric one-compressor, two-turbine gas-turbine power plant as being 5700 hp and its guaranteed fuel consumption as 10,200 Btu (LHV) per hphr at full load, it would seem safe to assert that the addition of the equipment needed to generate and introduce steam as previously described will result in a power plant that can be rated at 7500 hp with a fuel rate of 8800 Btu (LHV) per hphr at full load.

Additional advantage

The steam-addition process has the additional advantage that it is less affected by variations in ambient temperatures and load than is the conventional process.

As the compressor-inlet temperature increases, the temperature of the exhaust gases leaving the preheater increases, so that more steam will be generated, and the ratio of steam to air in the mixture fed to the combustor will increase also. Thus the flow through the turbine and the turbine pressure ratio will decrease much less rapidly as the compressor-inlet temperature increases than in the conventional process. The result will be that the reduction in capability and increase in fuel rate due to increase in ambient temperature will be much less for the steam-addition process than it is for the conventional process. Naturally the steam-addition process will not gain so rapidly with decrease in ambient temperature as does the conventional process, but this circumstance is controlling only at very low ambient temperatures.

Quantity of air decreased

As the load is decreased from full load, the quantity of air compressed is decreased, and the temperature at which the exhaust gases leave the preheater decreases, so that less enthalpy is available for generating steam; however, a greater fraction of the available enthalpy is recovered by the steam-generating equipment, so that the ratio to air increases. The thermal efficiency rises slightly, at first, reaches a maximum, and then decreases slowly. Thus the fuel consumption per horsepower-hour generated is as low as at full load over a considerable load range, while the fuel consumption per horsepower-hour generated increases rapidly in the conventional process as the load decreases from full load.

While the use of only one company's gas-turbine power plant in the steam-addition process has been detailed, this was done only because the large amount of information which has been published about this plant made it convenient to do so. It is not intended to suggest that gas-turbine power plants of other manufacturers may not be used in the process.

Bibliography

1 "Design Features of a 5000-hp Gas Turbine," by B. O. Buckland and D. C. Berkey, Trans. ASME, vol. 74, 1952, pp. 655-661.

2 "Gas Turbines and Centrifugal Compressors as Applied to Natural-Gas Pipeline Service," by T. R. Rhea and J. S. Quill, *Mechanical Engineering*, July 1953, pp. 534-540.

3 "A Regenerative Gas Turbine-Generator for Central Station Service," by H. C. David and R. L. Jackson, a paper prepared for presentation at the American Power Conference, Chicago, March 25-27, 1953.

4 "5700-hp Regenerative-Cycle Two-Shaft Gas Turbine Estimated Performance," by E. L. Richardson, revised June 5, 1953, publication 123 HA 441, General Electric Co., Schenectady, N. Y.

5 "4000 KW Regenerative-Cycle Two-Shaft Gas Turbine Estimated Performance," by E. L. Richardson, revised June 5, 1953 publication 123 HB 443, General Electric Co., Schenectady, N. Y.

6 "Test of a 4800-hp Gas Turbine Power Plant," by A. Howard and B. Buckland, ASME Paper No. 48-A-98.

In addition, see the following articles that have appeared in *GAS* magazine during the last few years: "The Combustion Gas Turbine," by Tracy Parks Jr., July 1954, page 93; "A Comparison of Design and Performance of Modern Compressor Equipment," by B. T. Mast, February 1954, page 108; "Four Years' Operation With Turbine-Driven Centrifugal Compressors," by G. Carl Cooper Jr., September 1953, page 116; "El Paso Natural's Gas Turbine-Driven Centrifugal Compressor Stations," May 1953, page 110; "Lower Unit Costs Achieved in Gas-Turbine Pumping Tests," by J. O. Stephens, June 1952, page 94; and "Pumping Gas With Gas Turbines," by J. F. Eichelmann and J. S. Quill, July 1951, page 80.

Transco initiates use of 36-in. pipe to loop mainline

ALTHOUGH a section of line about 10 miles long had already been installed elsewhere, Transcontinental Gas Pipe Line Corp.'s use of nearly 47 miles of 36-in. pipe to loop its Texas-to-New York line in Mississippi, Alabama, and Louisiana marks a milestone, the first time pipe of this size has been used in natural gas transmission.

Unusual methods

The contractor, Associated Pipe Line Contractors Inc. of Houston, met and overcame many construction obstacles along the line and employed unusual methods to lay the line. Associated chose the "sewer pipe" type of installation and lowered in a joint at a time, directly into the ditch. Bell holes had been cut during the digging operation and welding operations on the pipe were completed in the ditch.

It was necessary to have a battery of backhoes to handle the digging. They worked from 500 to 2000 yds ahead of the pipe gang, simultaneously cutting the ditch and making the bellholes at 40-ft intervals. Ditches were dug to a minimum width of 12 in. greater than the outside diameter of the pipe. Minimum cover is 30 in. in earth and 24 in. in rock.

Coating and wrapping

Coating and wrapping operations took place at Rosson-Richards Co. yards in Tylertown, Miss., and Selma, Ala. Because the pipe was to be handled a great deal, the coating included enameling, a glass-fiber wrap, an asbestos-felt wrap, a paper wrap, and a final whitewashing.

Bending was done after the pipe was wrapped. Out-of-round bends were prevented by use of a special Cinchbender that was equipped with two hydraulic outside clamps to grip the joint tightly when pressure is applied.

U. S. Steel's Consolidated Western Steel division at Orange, Texas, built the pipe.

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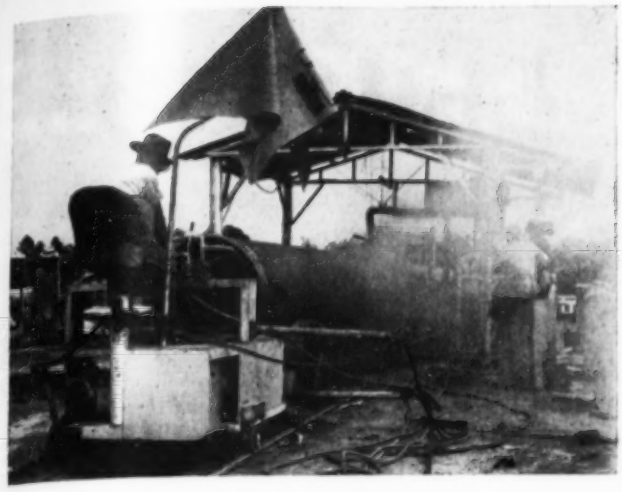
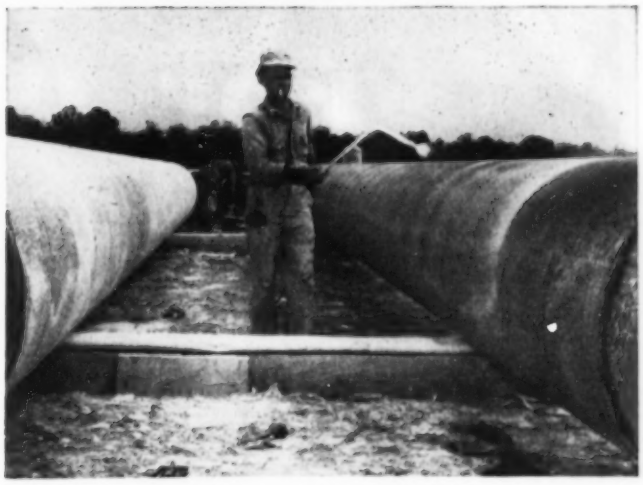
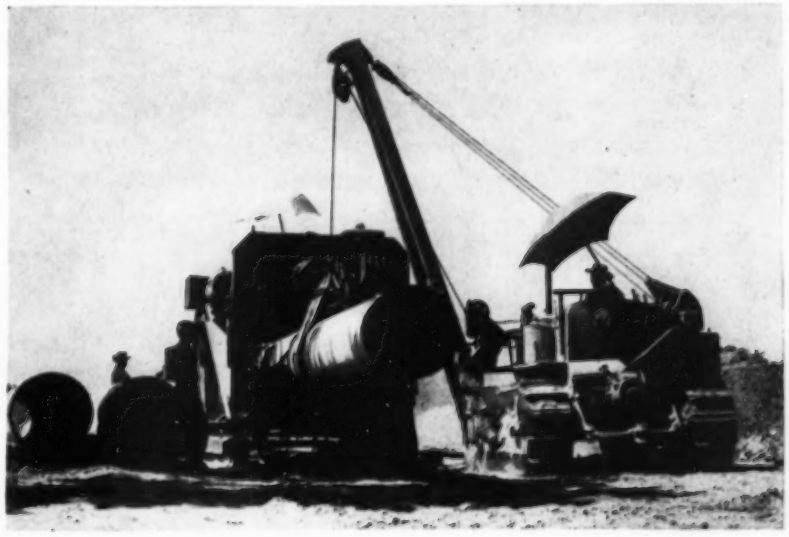




In the yard . . . **Operator of Rosson-Richards coating and wrapping** machine (left) at Tylerton, Miss., controls the whole operation from the seat, which moves backwards with each joint of pipe as it rotates and comes slowly through the coating machine. When each joint is completely coated and wrapped, the machine rolls the pipe off to the left on a pipe rack. Whitewash coat (right) is put on last following completion of the coating and wrapping job. The whitewash protects the coating from the elements until the pipe is in the big ditch. Note the padded surface on the rack holding the pipe.

Along the line . . .

Bending machine (right) on Mississippi spread makes overbends, sags, or sidebends to shape the 40-ft joints of 36-in. pipe to the terrain. Operating on the spreads alongside the big ditches, the machines bend each joint, if necessary, to fit the exact spot in the ditch where it will go. A sideboom lays the pipe beside its place in the ditch and another boom comes along later to put the pipe in the ditch just ahead of the firing line. On the line (bottom left) the pipe gang makes the lineup, puts in the stringer bead, makes the hot pass and then moves on to the next joint. Following behind are the welders who will do the longer jobs of making the filler and cap welds. Behind them a gang follows to coat and wrap the field joints started by the firing line gang. Hot pass in bellhole (bottom right) is made by a welder. This illustrates the process used to handle the giant-size pipe.



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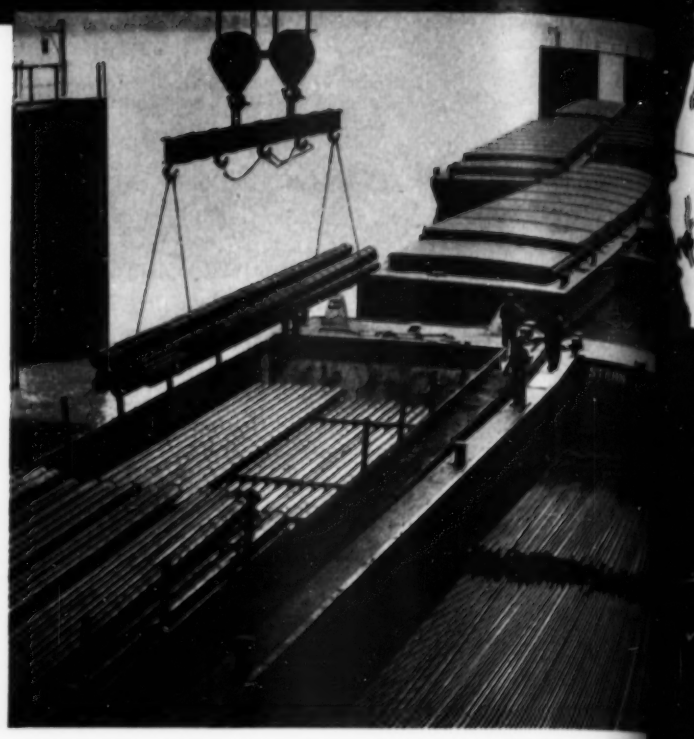
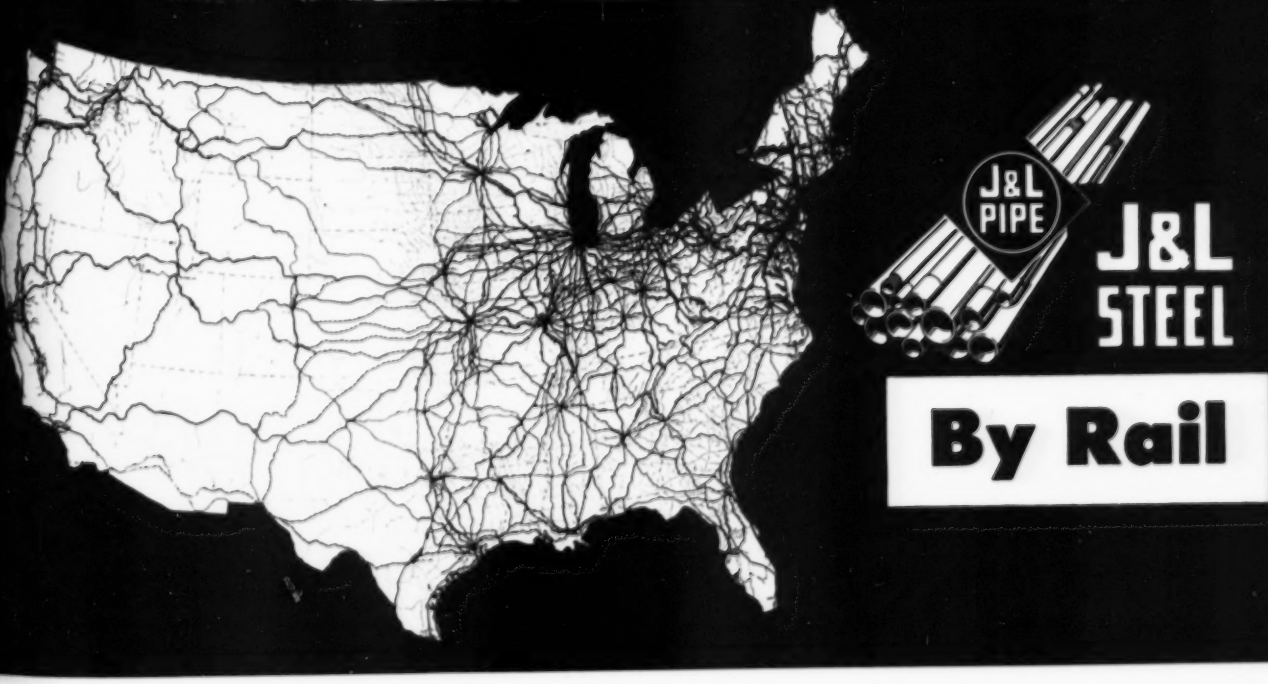
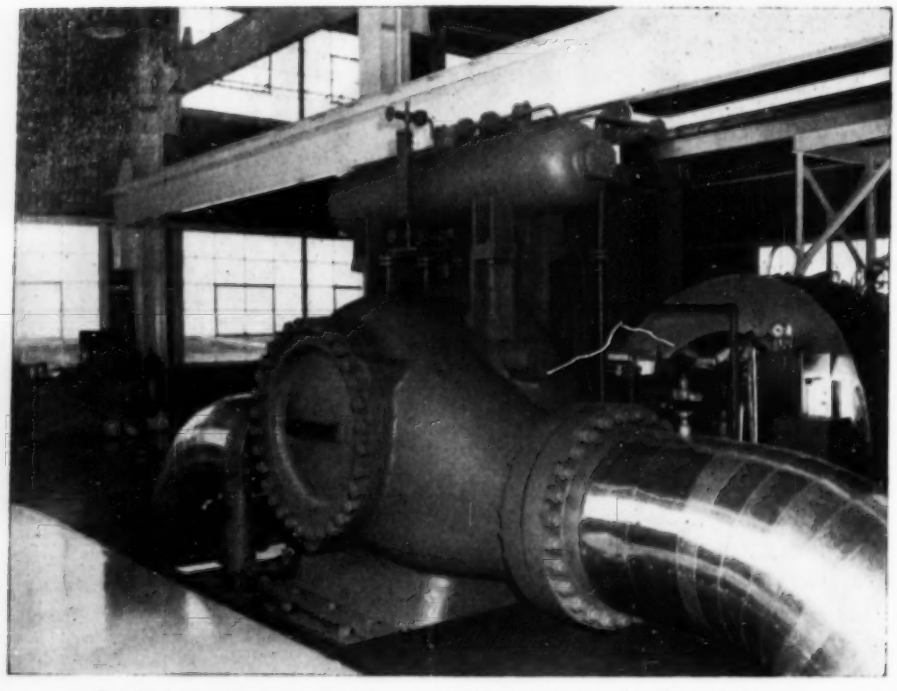


Loading line pipe at J&L's Aliquippa, Pa., barge docks

J&L's stocking and rail loading facilities at Aliquippa, Pa.

Line Pipe Delivery





Pipeline centrifugal compressor recently installed by Northern Natural.

Most of the literature published to date on gas turbine-driven centrifugal compressors has been slanted toward the turbine, which provides the driving power, rather than the compressor itself. Here the author fills in that gap with a rounded discussion of the latter component of the compressor team.

Centrifugal pipeline compressors

A study of their principles of operation, machinery, and performance, with a brief look at some present trends in their design for both ultra high- and low-volume gas pumping.

By **C. F. KOENIG III** • DeLaval Steam Turbine Co., Trenton, N. J.

THE centrifugal compressor is strictly a turbomachine, which means that it accomplishes work entirely by dynamic action of rotating blading on fluid which passes in a continuous stream through the machine. The fluid mechanics of such a compressor are quite complicated, but adequate, simplified methods for design and performance evaluation are well known.

At the pressures normally used in pipelines, natural gas does not behave as a perfect gas. A modified equation of state is used for most engineering calculations which utilize a supercompressibility factor Z to account for the deviation from a perfect gas:

$$Pv = ZRT$$

The symbols used here and in the following equations are defined as follows:

P—absolute pressure, lb/ft^2
v—Specific volume, ft^3/lb
R—gas constant, ft lb/lb ° F
Z—supercompressibility factor $= \frac{Pv}{RT}$
H—head = work per lb of fluid, ft lb/lb
k—ratio of specific heats
η—efficiency

The Z factor varies with the temperature, pressure, and composition of the gas, and must be determined by any particular set of conditions for which calculations are to be made.

The work equation for centrifugal pipeline compressor calculations is based on the well known relations for adiabatic or polytropic compression, again modified to account for supercompressibility. Our company has found it most satisfactory to use a modified equation for adiabatic work:

$$H = ZRT_1 \frac{k}{k-1}\left[\left(\frac{P_2}{P_1}\right)^{\frac{k-1}{k}} - 1\right]$$

The value of supercompressibility factor used in this expression is its mean value through the compression. In most cases it is found that the rates of increase of temperature and pressure through the compression are such that the supercompressibility factor remains practically constant, and its value at suction conditions may be used with good results.

The ratio of the adiabatic work as calculated in this manner and the actual work required for the compression is

This article has been adapted from a talk presented at the fall meeting of the ASME in Kansas City, Mo., Sept. 22-24.

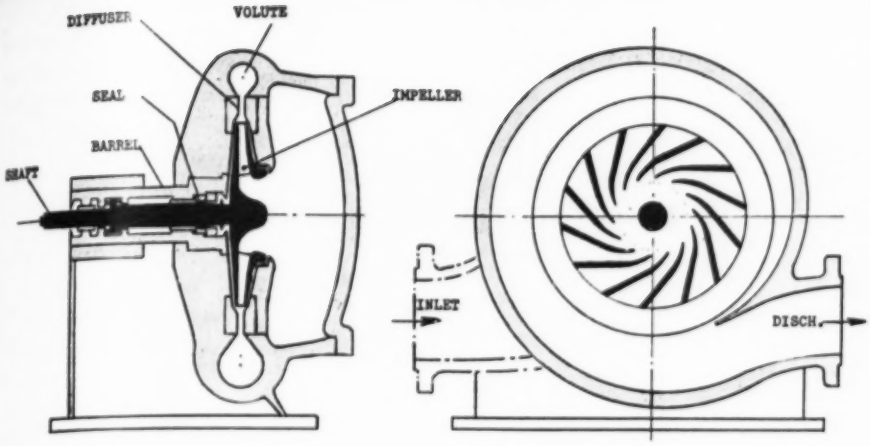


Fig. 1 (**above**). Proportions and construction of a typical, single-stage pipeline compressor.

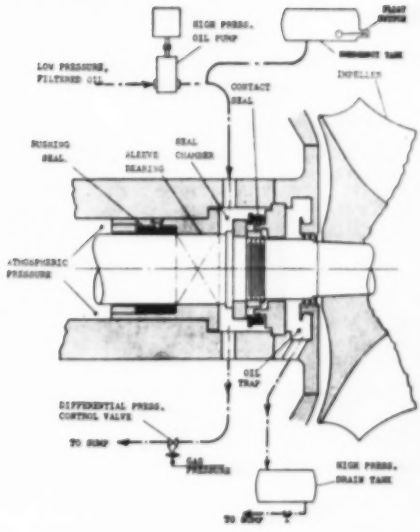


Fig. 2 (**right**). Typical seal system on pipeline compressor.

defined as the adiabatic efficiency. Thus

$$\eta_{ad} = \frac{\text{Adiabatic work}}{\text{Actual work of compression}}$$

Mechanical losses not related to the aerothermodynamics of the compression must be accounted for to determine the shaft input required. These losses include bearing losses, seal losses, shaft-driven pump power input and similar items. The brake efficiency, or shaft efficiency, is defined as

$$\eta_{br} = \frac{\text{Adiabatic work}}{\text{Actual work of compression} \quad \text{Mechanical losses}}$$

It is worth noting that the mechanical losses are not a constant percentage of the total work. Thus, while an operator is concerned only with the power required at the coupling and the brake efficiency, the designer must also concern himself with the aerothermodynamic performance of the machine which is more accurately indicated by the adiabatic efficiency.

Description of machinery

Centrifugal pipeline compressors built to date have been of the single stage type. *Fig. 1* illustrates schematically the proportions and construction of a typical, single-stage pipeline compressor. The inlet and discharge flanges of this compressor are located on the same centerline for convenience in laying out multiple-unit compressor stations. The impeller is overhung on a "stiff" shaft, which rotates in pressure-lubricated sleeve bearings and is positioned axially by a Kingbury thrust bearing. The rotor bearings and shaft seal are assembled in a barrel, which is so arranged that the entire assembly can be removed in one piece. A removal end cover is provided on the case to allow removal of the barrel assembly.

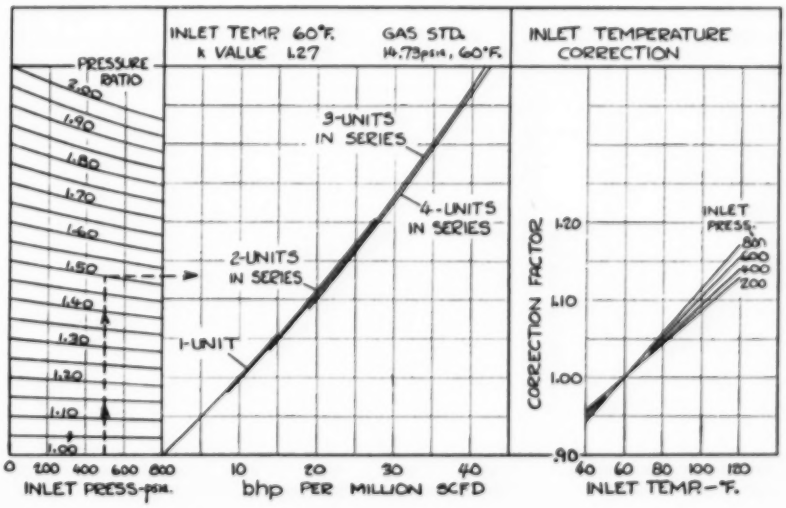
No gas leakage from the compressor can be tolerated. To meet this requirement, a considerable portion of the development effort on pipeline compressors has been devoted to producing a reliable shaft seal. *Fig. 2* shows schematically a typical seal system for this type compressor. In principle, the object of this system is to provide a chamber between the interior of the compressor case and atmosphere which is kept filled with oil at a pressure slightly higher than the gas pressure within the case. Oil leakage from this chamber is kept to a minimum by close-clearance bushings, by contact seals or, as in *Fig. 2*, by a combination of the two.

The seal system shown in *Fig. 2* is a simplified version of one which has been used very successfully by the company in all of its pipeline compressors to date. The contact seal allows oil leakage of the order of 500 cc per hour, or about 3 gal. per day, while the bushing seal passes 3 to 4 gpm in this arrangement. The contact seal, while considerably more expensive, is considered well worthwhile on the compressor end of the seal because of the difficulty of successfully removing large quantities of leakage oil from the area between the seal chamber and the compressor case. On the atmospheric end of the seal chamber drainage is no problem, and the bushing seal is then more appropriate.

Performance

Pipeline operators think of performance in terms of standard cubic feet of gas per day, pressure ratio and horsepower. However, the quantities that define the performance of a centrifugal

Fig. 3. Power requirements for single-stage compressors.



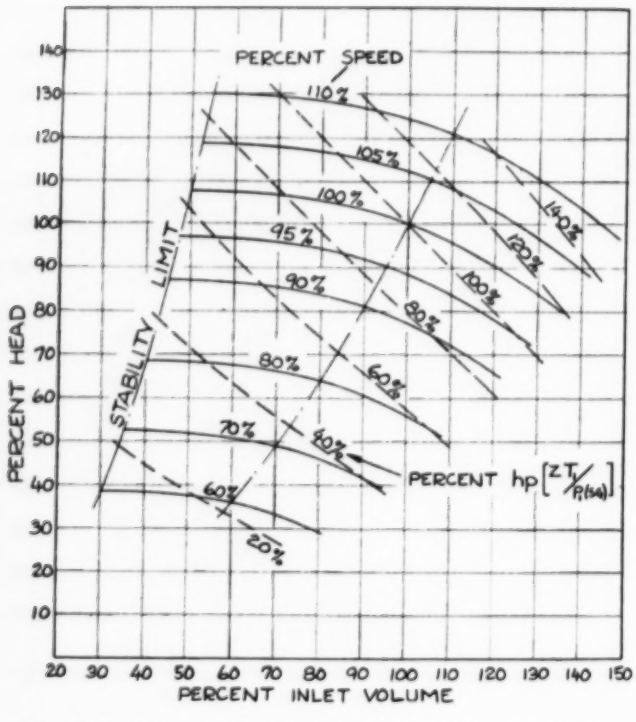


Fig. 4. Typical performance of a single-stage compressor.

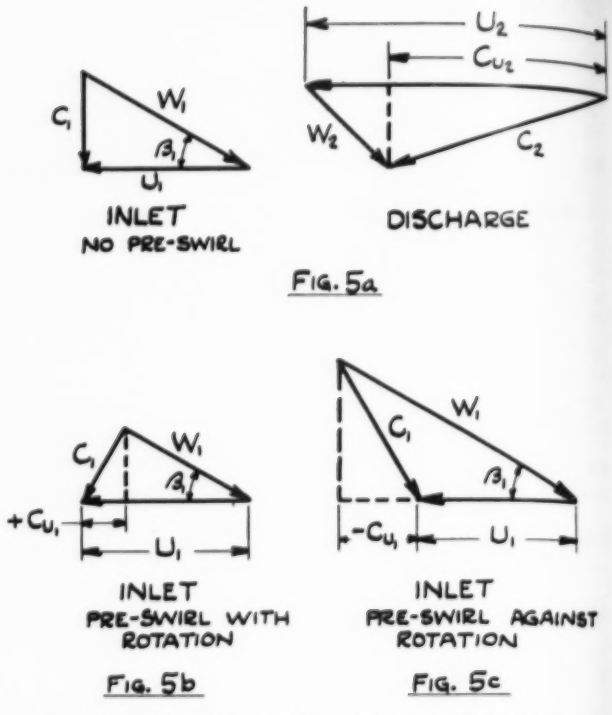


FIG. 5a

FIG. 5b

FIG. 5c

Fig. 5. Effect of inlet guide vanes on velocity diagrams.

compressor are actual volume flow, work per pound of fluid, and efficiency. Attempts to generalize centrifugal compressor performance in terms of conventional pipeline terminology have caused a great deal of mental anguish in various quarters, and have not yet, to my knowledge, been entirely successful.

A basic plot for estimating purposes is that shown in *Fig. 3*. This curve shows the horsepower per million standard cubic feet of gas per day for single-stage centrifugal compressors in series operation. One correction scale is provided to account for the supercompressibility effect at various inlet pressures, while another correction is necessary to account for the effect of inlet temperature variations. This curve is prepared for identical compressors in series and assumes a half-percent pressure loss between each machine.

Fig. 4 shows a generalized plot of centrifugal compressor performance in terms of volume flow, work per pound of fluid (head) and a pseudo-dimensionless horsepower function. This curve is perfectly general, and can be applied to any centrifugal compressor of the same general design. With a curve of this type, it is necessary to know only the design point, or 100% values, of the variables in order to define completely the performance of the compressor. Obviously, this curve is far distant from the aforementioned pipeline parameters of standard cubic feet per day, pressure ratio and horsepower, but it is well to remember that any charts in such terms must start from data of the nature of *Fig. 4*.

Fig. 6. Constant speed performance with adjustable inlet guide vanes.

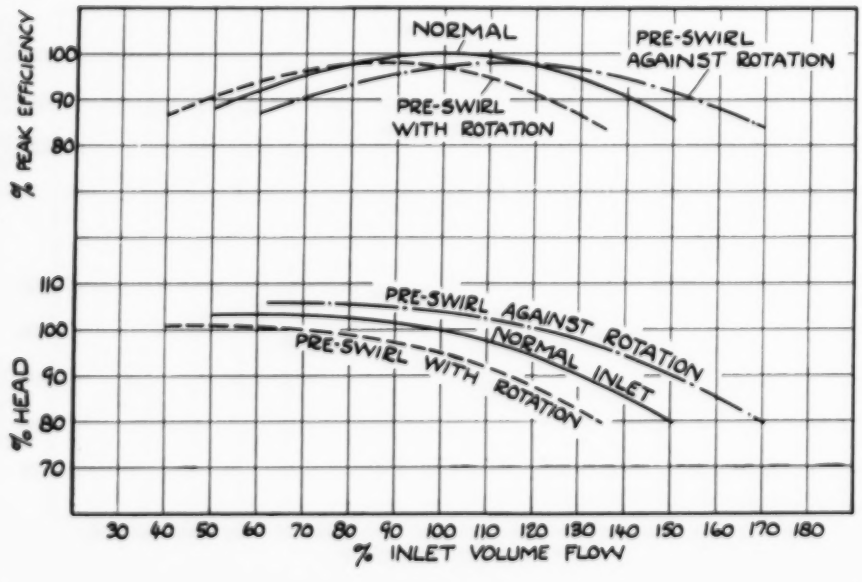


Fig. 7. Four-unit compressor station.

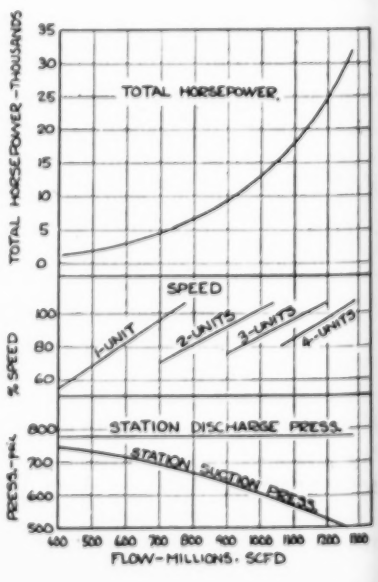


Fig. 4 illustrates a number of interesting facts about the characteristics of a centrifugal compressor. With a fixed resistance to pump against (i.e., a nozzle, orifice, etc.), the flow of a single-stage centrifugal compressor will vary directly as the speed, the head will vary as the square of the speed, and the power required for compression will vary as the cube of the speed, all to a close degree of approximation. Some deviation from these relations may be expected where low Reynolds Numbers or high Mach Numbers occur in the flow passages, but such circumstances seldom obtain in pipeline applications. Unstable operation occurs below approximately 50% of the flow for optimum performance, and operation in this range should be avoided.

It is usually considered distinctly advantageous for the head or pressure ratio curve of a centrifugal compressor to droop as little as possible over a wide range of flow. It is possible to design a compressor so that this droop will be very gradual, but some droop must always be present for stable operation. In certain applications for pipeline compressors, notably the case where the driver is a constant speed motor, it is desirable to improve upon even the flattest head-flow curve obtainable. The solution in this case is the use of adjustable inlet guide vanes, which impart swirl to the fluid before it enters the impeller.

The effect of controlled pre-swirl on the output of a centrifugal compressor can be best explained by typical velocity diagrams constructed at the inlet and discharge of the impeller. For normal operation, i.e., where no pre-swirl is introduced, the diagrams are as shown in *Fig. 5a*. The notations on the velocity vectors are defined as follows:

C—absolute velocity

W—velocity relative to the rotating impeller

U—linear velocity of the impeller blades

β_1—flow angle at impeller inlet

Cu—Tangential component of absolute velocity

Subscripts 1, 2—impeller inlet and outlet conditions, respectively

The classical relation for the work in any turbomachine is

$$\text{Work/lb of fluid} = \frac{U_2\,Cu_2 - U_1\,Cu_1}{g}$$

In *Fig. 5a* the absolute inlet velocity is meridional, or perpendicular to the tangential direction, so that Cu_1 is zero and the work equation reduces to

$$\text{Work per lb of fluid} = \frac{U_2\,Cu_2}{g} \quad \text{(no pre-swirl)}$$

In *Fig. 5b* pre-swirl in the direction of rotation has been introduced, resulting in a modified inlet velocity diagram. The discharge diagram will remain substantially unchanged. Since the Cu_1 term is positive, the work will be less than that of the normal inlet case by the quantity $\frac{U_1\,Cu_1}{g}$. Maximum efficiency will occur when the inlet flow angle β_1 is the same as its value with no pre-swirl, which requires lower values of C_1 and W_1, hence a lower flow.

In *Fig. 5c* pre-swirl against the direction of rotation has been introduced. Here the Cu_1 term is negative, so that the work will be greater than that of the normal inlet case by the quantity $\frac{U_1\,Cu_1}{g}$. Maximum efficiency again will occur at the original value of β_1 which now requires larger values of C_1 and W_1, hence a larger flow.

Fig. 6 shows typical performance of a compressor equipped with adjustable inlet guide vanes. It is seen that pre-swirl with the rotation reduces the head and the flow for best efficiency, while pre-swirl against the rotation increases the head and the flow for best efficiency. It is also apparent that the peak efficiency deteriorates slightly with pre-swirl in either direction. This is due to turning losses in the inlet guide vanes and slightly increased losses in the fixed impeller, diffuser and volute passages at flows different from the design flow. An illuminating discussion of the advantages of centrifugal pipeline compressors equipped with adjustable inlet guide vanes has been published recently.[1]

[1] "Centrifugal Compressors of New Design," by C. W. Marvin, *Petroleum Engineer*, May 1952.

Fig. 8. Differential method of presentation. Curves were prepared for 100 psi increments in discharge pressure.

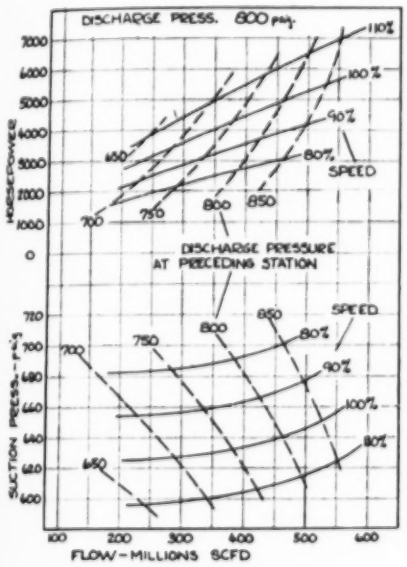


Fig. 8a

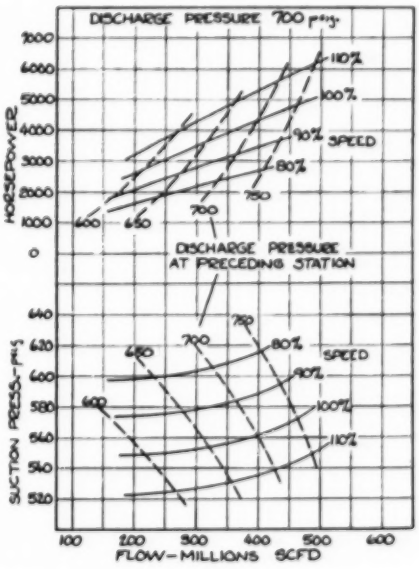


Fig. 8b

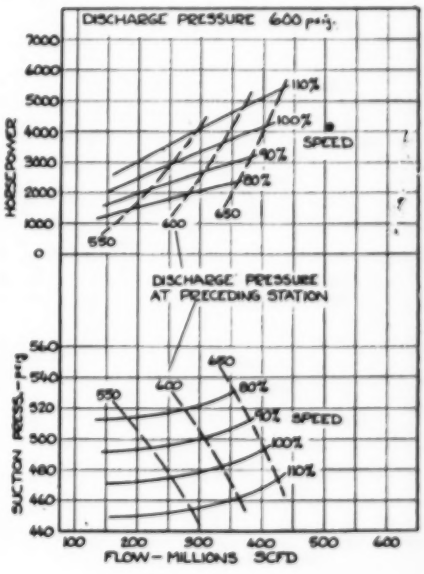


Fig. 8c

Cooling tower design studied

A UNIQUE cooling tower laboratory operated by J. F. Pritchard & Co. outside Independence, Mo. is searching for the magic equation of cooling tower design, which will evolve a formula that will enable engineers to predict the performance of cooling tower decking without actual testing.

Pritchard engineers are determining how well various types of decking cool water; the air pressure drop drop through the decking; how much wood is required; how simple the decking is to fabricate; and how easy it is to install and remove.

A tower 50 ft high and 6 ft square is believed to be the only cooling tower testing setup of its size that has controlled air inlet conditions.

The experimental arrangements can handle water concentrations approaching ½ gal. per minute per square foot up to and in excess of 10 gal. per minute per square foot.

Heat loads in excess of 10 million Btu per hour can be applied. The air system is on automatic electronic control for both air wet bulb and dry bulb temperatures. Controlled air inlets enable the lab to test 80° wet bulb in winter.

Foolproof controls extend to every facet of the testing arrangement. The humidity of the air stream is accomplished with live steam. The dry bulb is automatically controlled with a finned tube air heating coil. Water temperature to the cooling tower is automatically controlled and it is measured with a series of calibrated orifices, with an accuracy of 1%. And air flow is metered with a Pitot tube, used in conjunction with a variety of orifices plates

Cooling tower erected by Pritchard for testing purposes.

High-specific-speed impeller is the latest development in the design of centrifugal pipeline compressors.

Station and line operation

Many curves and charts have been developed to illustrate the operation of a centrifugal compressor station in a pipeline. It may almost be said, in fact, that there are as many types of operating curves as there are pipelines. Two types of presentation have been particularly well received and will be described here.

Fig. 7 shows the operating characteristics of a 4-unit centrifugal station pumping against a constant discharge pressure. Assuming that the discharge pressure is maintained and that the suction pressure will vary with flow according to the characteristics of the pipeline, this curve shows, for any suction pressure, the flow, speed of machines, number of machines that should be operating, and the total horsepower required. The curve cannot be applied where the flow-pressure relationship varies from that shown, but it is feasible to prepare several plots for the same machinery operating under different flow-pressures relationships.

Fig. 8 shows a different method of presentation which takes into account the effect of the discharge pressure of the preceding station on the flow. Curves that show the suction pressure and horsepower at different speeds and flows are drawn for a constant discharge pressure of the station under consideration. Several such curves are then drawn to cover the normal range of discharge pressure in reasonable increments. Lines of flow vs. suction pressure as it is affected by the discharge pressure of the preceding station are then superimposed. *Figs. 8a, 8b,* and *8c* show three such curves prepared for 100 psi increments in discharge pressure. This type of presentation shows very clearly the relation of the output of the previous station to the load in the station being considered.

New development

The pace of centrifugal pipeline compressor development has been swift and continues to exercise the ingenuity of the compressor designer. The latest development has been the high-specific-speed impeller. This is a so-called "mixed-flow" impeller which is intended for operation with high-speed gas turbine drivers on large pipelines where the compressor must pass very high volumes but deliver relatively low heads. The design of this impeller is based on forced-vortex principles and the blading is machined from a solid forging by three-dimensional milling in order to obtain optimum shapes for high performance.

Centrifugal compressors have thus far been considered principally for use in large pipelines where the gas flow is 300 MMscf per day or higher. The high-specific-speed impeller mentioned above is a major development for pipelines which carry 1 billion or more standard cubic feet of gas per day. On the other end of the scale, thinking is now turning toward small-flow pipelines and feeder lines where a single-stage centrifugal compressor will not usually deliver a high enough pressure ratio or absorb enough power to make its use attractive. The solution here seems to be multistage compressors, and such machines are being seriously considered. Multistage compressors are, of course, commonplace in other fields, but the requirements of pipelines engender certain special problems which must be carefully analyzed before multistage pipeline compressors become production items.

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

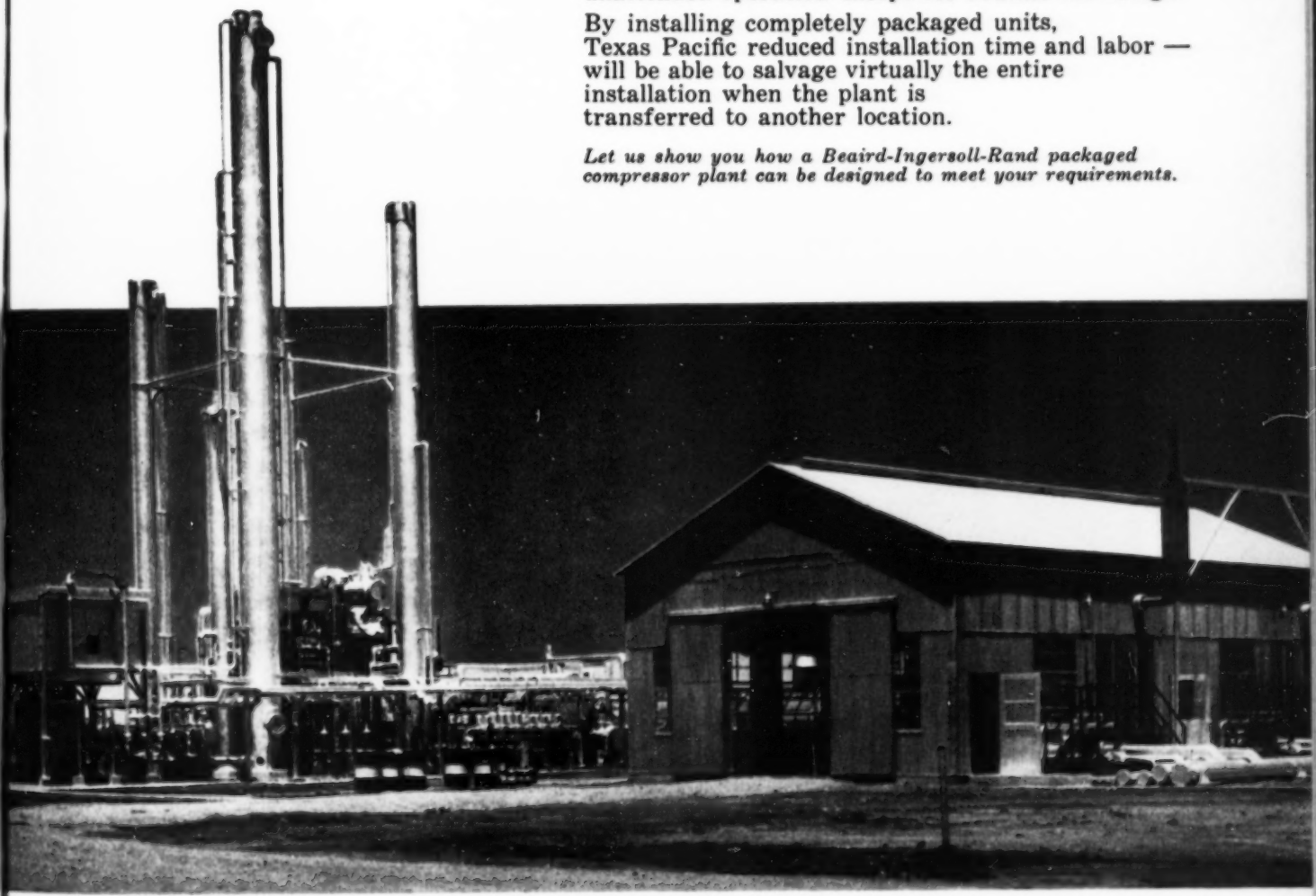
PACKAGED COMPRESSORS FOR GASOLINE PLANT

TEXAS PACIFIC COAL AND OIL COMPANY recently opened a compression-refrigeration type gasoline plant near Hamlin, Texas. The multiple compression tasks required in this process were entrusted to two 550 h.p. Beaird-Ingersoll-Rand packaged compressor plants. Each unit uses three stages to raise raw gas from 0 to 530 psig. The fourth cylinder compresses propane used as a refrigerant in the process. Plant vapors are collected and delivered into the sales line by a fifth cylinder added to one of the compressor plants.

To assure continuous operation, Texas Pacific installed two packaged units rather than one large compressor of equal horsepower. Plant pressures and operations can be maintained, when necessary, by one unit, while the other unit is shut down for maintenance or repair — with the loss of only a portion of the plant's total producing capacity. Automatic controls built into the units permit their unattended operation except for routine servicing.

By installing completely packaged units, Texas Pacific reduced installation time and labor — will be able to salvage virtually the entire installation when the plant is transferred to another location.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.



Texas Pacific Coal and Oil Company's packaged compressor plant, Velta Plant, Fisher County, Texas—equipped with two Beaird-Ingersoll-Rand 550 h.p. 10 SVG FOUR CYCLE gas engine driven compressors, Young radiators and all necessary equipment and controls. Other sizes 110 to 660 h.p.

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MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

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ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

GAS staff report

Six years of operation prove value of automatic booster station

By J. FRED EBDON
Managing Editor

Inlet and outlet headers of the automatic booster station.

A SIX-YEAR span of experience at United Gas Pipe Line Co.'s Dallas junction station has proved the feasibility of using an automatically controlled compressor station as a pressure booster for peak-load demands.

This unusual installation, located along the Mineola-Dallas-Fort Worth line, assures ample pressures at the Fort Worth end of the line despite demands at Dallas. When Dallas pressures dip below 200 psig, the pressure required to maintain an adequate volume rate of flow to Fort Worth, the station automatically cuts in and out in relation to the pressure fluctuation.

Control of the reciprocating units is by suction valve unloaders, since it is not considered good practice to materially vary engine speed or inlet and discharge pressures in this type compressor.*

*A detailed description of the equipment installed can be found in the March 1950 issue of *GAS*, page 80

During the off-peak hours, line pressure is sufficient, so the valve unloaders completely unload the compression units and they float on the line until needed. When the pressure starts to drop, as the connected loads are fired in the morning, a high-pressure, direct-acting range valve that is controlled by the compressor discharge pressure transmits operating pressure to a speed-pressure regulator, which, in turn, varies the speed of the engine. The range valve controls the operating pressure to the speed-pressure regulator in inverse proportion to the compressor discharge pressure, i.e., as the discharge pressure starts to decrease, the engine rpm is increased prior to loading the compres-

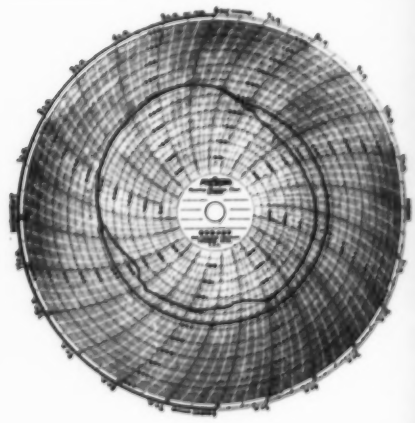

Chart indicating the excellent pressure control for a 24-hour period during winter.

You buy steel by specifications...

...be sure you know your Pipeline Enamel "Specs"

You wouldn't think of buying steel, pumps or other similar items without seeing written specifications that tell you exactly what you're getting for your money. Then why shouldn't you buy *pipeline enamels* in exactly the same way? Why not compare enamels, specification by specification, and insist that the enamel you buy stays within those written specifications?

Published specifications of *Pitt Chem* Modified, Standard and Plasticized Enamel are available and will gladly be sent on request. Samples, too. We invite you to test the softening point, ash, penetration, and other important specifications of Pitt Chem Enamel. You'll prove to your own satisfaction that coal-to-enamel quality-control definitely does produce a true-to-specification coating that gives you better performance above ground and longer-lasting protection below.

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- ★ Cold Applied Tar Base Coatings

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Automatic booster... Station operation involves only a minimum of attention

sion cylinders. This increases the cooling water circulation and fan speed.

Pressure drops

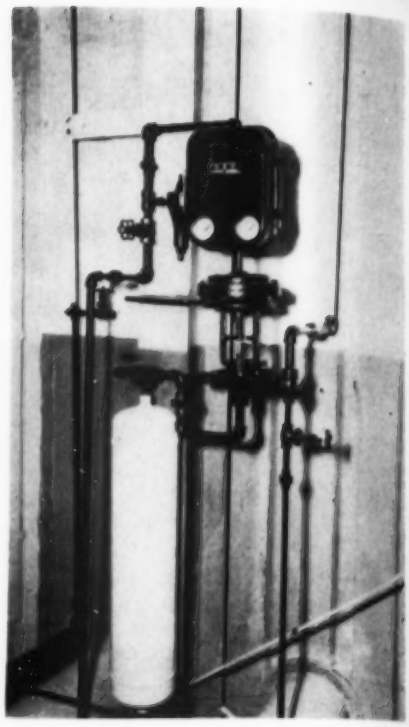
As the pressure continues to drop, the valve unloaders cease unloading as compression is needed and the discharge pressure begins to stabilize. The two-pen, pressure-recording chart illustrated shows the consistency with which the discharge pressure to Fort Worth is held constant under varying suction pressures.

Special Ingersoll-Rand built, outside-operated, free air unloaders linked with inlet valve free air unloaders in cylinders, were used in this application for unloading at maximum discharge pressure. The control system to the special loaders consists of Ingersoll-Rand Type UF3 regulators acting on the unloaders indirectly through Type U-58 three-way valves. This control system unloads the compressor cylinders in steps. The three-step regulators (Type UF3) control full, one-half, and no load. Thus, the compressor station modulates in response to the variation of the discharge pressure.

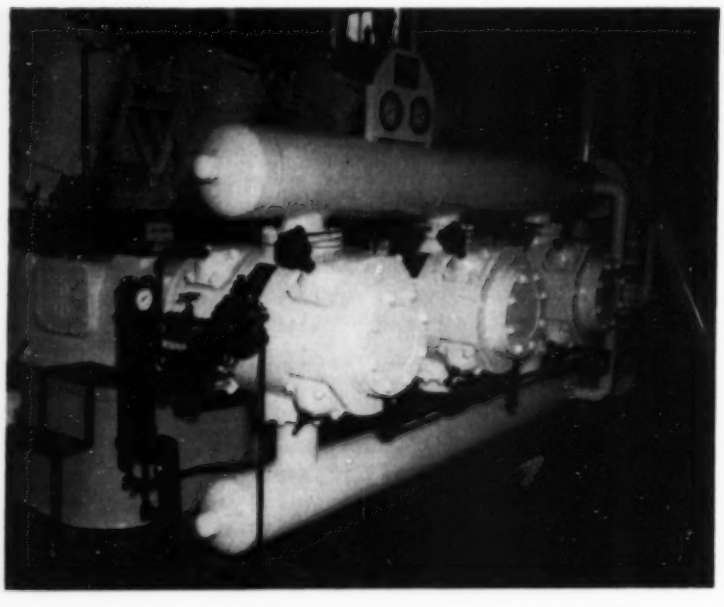
In addition to the previously mentioned maximum discharge unloaders, there are two suction valves equipped with unloaders that are controlled to operate at a minimum suction pressure of 150 psig. This feature is designed to prevent overloading should the Dallas or suction pressure fall below this value. A Climax Type 1400 back pressure controller and Type 33 diaphragm motor valve are the controlling mechanisms for these unloaders.

Gradual declination

An analysis of the chart record will show that in this typical 24-hour period, pressures reacted to delivery loading with a gradual declination from about 5:45 a.m. until 6:45 a.m. Then, a marked change in the slope of the curve indicates gas was taken from the line in increased volumes. Between 7:30 and 7:45 the compressors started loading and continued, stage by stage, until completely loaded. During the day the compression cylinders were automatically loaded and unloaded as needed. It will be noted that the Fort Worth discharge pressure showed negligible pressure variation throughout the day until midnight. At that hour, the pressure had risen (as the load dropped off) to near the 250-psig line. This pressure value was the setting on a Mercoid pressure switch, so when this value was reached, the circuit to a solenoid valve in the fuel supply line to the station was broken, the valve closed, and all engines were taken out of operation. Gas continued to flow through the compressors as the pressure equalized through the cylinders.



Instrumentation in the station showing pressure actuated motor and transmitting unit.



Controls for the free-air valve unloaders on compressor cylinders.

Routine maintenance

The station operation involves a minimum of attention and only routine maintenance. Actually, two operating engineers have been able to keep the station on-stream and do the necessary building maintenance, yard care, etc. It was found that the station could be left unattended from 4 p.m. until 8 a.m. This, of course, resulted in economy of operation. Experience soon indicated that the station could be manually shut down on Sunday because the demand was never great enough to require the station to boost the pressure.

United's six years of experience with the Dallas junction station constitutes operating proof of the feasibility of an automatically controlled compressor station being operated as a pressure booster.

You Can Insure Permanence with SOMASTIC® Pipe Coating

Crude Oil Line, SOMASTIC Coated, Was Lowered from Old Position

...HERE'S PROOF!

Crude Oil Line Uncovered After 11 Years ... The 10¾" SOMASTIC Coated pipe line shown at the left had been underground in irrigated sandy loam, generally corrosive, for over 11 years when housing developments required that it be uncovered and lowered. Inspection of the line revealed *no deterioration* and *no repairs were required.* In fact, the line was in such good condition that it was never raised above ground. Note in the picture how trenching operation permitted line to be moved to the right, out of its former position, and lowered to its new position.

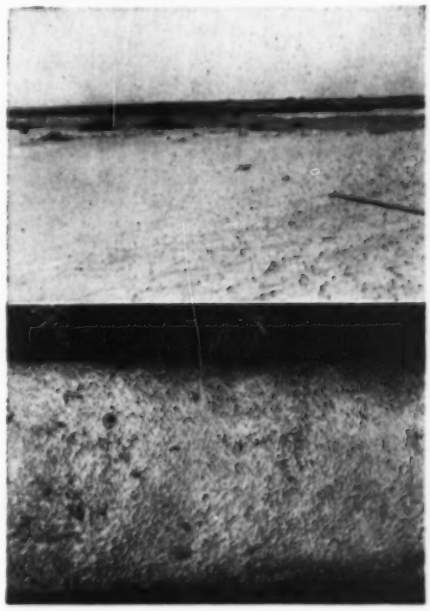
...AND MORE PROOF!

Natural Gas Line Uncovered After 11 Years ... The close-up of the 8⅝" SOMASTIC Coated pipe at the right is typical of the natural gas line uncovered after 11 years underground in alkali uncultivated soil under a dry lake bottom. Note the *lack of damage!* Any physical or chemical changes that had occurred were so slight that *normal handling* methods were employed and the pipe re-used.

HERE'S WHY...

SOMASTIC Pipe Coating is *thick.* There are fewer pits under thick coatings. It is *seamless.* There are no holidays because of overlapping layers, or bubbles. It is *reinforced.* The reinforcement is permanent and uniform. It is *rigid yet elastic.* Withstands depression over long periods, absorbs pipe movement and changes in pipeline temperature. And finally... SOMASTIC Pipe Coating is *proven under adverse soil conditions for more than 23 years.*

Natural Gas Line, SOMASTIC Coated, Was in Excellent Condition after 11 Years under Dry Lake Bottom.



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   - 3. The CENTRILINE Process (for 16" to 144" pipe)
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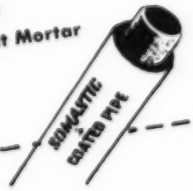

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Pipeline Communications and Electronics

By FRANK CHAPMAN

Continuous power system aids microwave reliability

ONE of the prerequisites of a dependable microwave circuit is provision for an auxiliary power source which will automatically and instantly supply power to repeater station equipment when the main source of power is disrupted for one reason or another.

With the trend in the gas industry toward the use of microwave for remote and supervisory control this requirement is becoming more and more important. A power source failure of even very short duration can considerably disrupt operations if it takes place at a time when control instructions are being transmitted.

Altogether aside from this fact, however, the psychological effect of a circuit drop-out due to power failure, or the possibility of a power failure causing a circuit drop-out, tends to limit the use of microwave to where the fullest extent of its capabilities are not being realized. While circuit failures caused by some peculiarity of propagation are accepted because of certain unknowns in the technique, a failure caused by loss of power is not looked upon in this light because it can be guarded against through proper design of standby equipment.

One system which has been designed to provide a continuous source of power makes use of an ac motor, an ac generator, and a dual-purpose dc machine that acts either as a motor or generator.

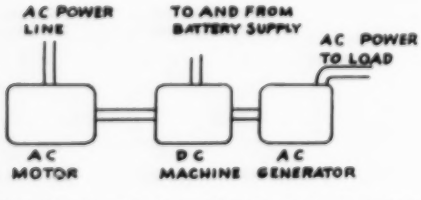
Under normal operating conditions the ac motor is fed from the outside power source, driving the ac generator, which in turn supplies power to the load—the load in this case being the microwave repeater equipment. However, when the line power fails or when the voltage drops below a certain predetermined safe value, an automatic control disconnects the ac motor from the power line and connects the dc machine to a bank of storage batteries.

The dc machine then operates as a motor driving the ac generator. Since all three parts of the unit are on a single shaft there is no interruption of power in the switch-over from normal to auxiliary power. The kinetic energy retained in the rotating mechanism carries over during the short period of time required in the switching operation.

When the line power is restored, the ac motor is reconnected to the power mains and resumes its role as prime mover for the system. During normal operation the dc machine is used as a generator to charge the bank of storage batteries. The control equipment, which takes the ac motor off the line when failure occurs and puts it back on when power is restored, also converts the dc machine from a generator to a motor.

The unit, developed and built by Bogue Electric Manufacturing Co. of Paterson, N. J., "floats" on the line between the power source and the microwave repeater equipment. With power constantly taken from the ac generator there can be no loss of power to the equipment with a changeover from the main power source, through the ac motor, to standby power source, through the dc machine.

Standby battery requirements will, of course, depend upon the length of time that a unit might be expected to operate from battery power. The Bogue unit will operate equally well from any standard type of battery.



Sketch showing how the ac generator may be driven from either the ac motor or the dc machine.

New mobile unit for noisy areas

Operating flexibility and extra power to overcome high audible noise levels are two characteristics of a new, low cost, "packaged" two-way radio system recently placed in production by Motorola for use in repair trucks or other similar vehicles. The unit provides a means of directing a work crew's activities as well as communicating with headquarters and other vehicles. It is particularly recommended for use in industrial areas characterized by high audible noise levels from machinery, trucks and other sources.

Colorado Interstate's microwave system completed

A 230-mile turn-key micro radio relay system which links the Colorado Interstate Gas Co. at Colorado Springs with its pipeline compressor stations and gas-producing fields in Kansas and Oklahoma has been completed by the Engineering Products Division, Radio Corporation of America.

The new system contains one of the longest single microwave radio hops ever placed in service, according to C. M. Lewis, manager, RCA Communications Equipment Marketing. The long-range hop covers a distance of 81.5 miles between repeater stations located atop Cheyenne Mountain and at Todd Point, both in Colorado.

The microwave radio relay system utilizes standard RCA CW-20-A microwave equipment operating in the 2000-megacycle band, and provides both voice and VHF control circuits for communications links. The RCA turn-key installation includes all essentials from system layout and building construction to transmitters, repeater stations, and antennas.

Philco opens new West Coast office

Philco Corp's. government and industrial division has announced that its western regional headquarters has been moved to new and larger offices in Los Angeles.

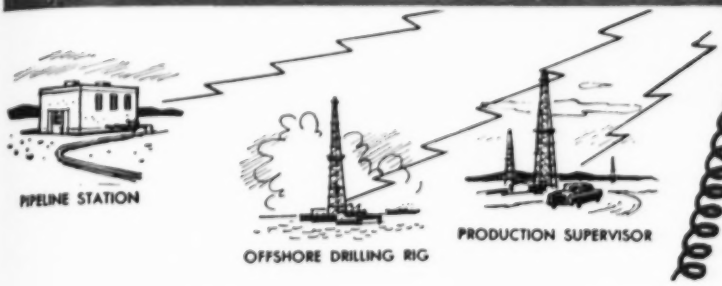
James D. McLean, general sales manager of the division, said the transfer from Beverly Hills to Los Angeles (10589 Santa Monica Boulevard) was made necessary by the rapid growth of the corporation activities for both government and industry on the West Coast.

New speaker for Motorola equipment

Motorola is now shipping as a standard accessory with the mobile two-way radio creased cone area which improves the increased cone area which improve the intelligibility of voice messages.

Messages from feminine or even male dispatchers with unique voice characteristics will be easier to understand because the entire voice range transmitted is more uni-

Expanding Petroleum Industry Gets—and Keeps—Operational Control with Motorola 2-way Radio



Fast, practical radio system ties widespread operations directly to main office—real operational control!

Developing new fields . . . profitably working old . . . literally any job you're doing can be done faster, more efficiently, and at less cost with Motorola 2-way Radio. Radio makes your far flung operations a single unit—connects distant control centers, road superintendents, even offshore rigs, seismic crews to headquarters in seconds. Here are examples of practical, everyday uses of Motorola systems:

- Well to Office communications
- Mobile communications to all points
- 24-hour service on the job
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- Daily scheduled well-progress reporting
- Reporting repairs, supplies, mud control
- Well logging service
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Motorola 2-way Radio has proved its dependability with 24-hour duty under every rugged situation. Dependability means money savings, too. Find out about this profit tool of the petroleum industry now. Your nearby Motorola communications engineer will be glad to give you all the facts.

Dispatcher at central office is key man in efficient communications system. Through him—and radio—supervisors and management can have complete control over the entire operation.

national
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service

Motorola . . . the complete supplier of radio communications and industrial control, microwave relay, power line carrier, supervisory control, frequency shift V.F. carrier, mobile communications, and telemetering equipment.

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Rogers Majestic Electronics Ltd., Toronto, Canada

formly reproduced without excessive attenuation of particular voice frequencies.

The speaker will be particularly useful in fringe reception areas where ambient audible noise levels are high.

A unique design incorporates a magnet assembly which is actually inside the cone in order to reduce space requirements.

New base stations announced by Du Mont

Two new complete base stations for users of mobile radio systems were announced recently by the Mobile Communications Department of Allen B. DuMont Laboratories Inc. The units, designed for 25-54 mc. and 450-470 mc. bands, are for use with two of DuMont's three mobile transmitter-receiver systems introduced earlier this year, as well as with other makes of mobile equipment.

One of the units, DuMont Type MCA 151-A, is designed to fill the requirements of a base station for two-way frequency modulated communications at any preselected frequency in the 25-54 mc. band. Multi-frequency operation up to four channels is available for the transmitter within band of 1% of carrier frequency. The unit is entirely self contained providing transmission, reception and termination facilities.

DuMont types MCA 450-A and MCA 451-A are complete base stations incorporating transmitter, receiver, termination panel and power supply for two-way communication in the 450-470 mc band. Type MCA 450-A operates in the 450-460 mc commercial band, while type MCA 451-A operates in the 460-462 mc and 468-470 mc. Class A citizens band.

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The World Over
wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
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RCA offers microwave "guidebook"

An "engineering guidebook" to the proper selection and arrangement of RCA microwave relay equipment for point-to-point communication in a great many applications over distances up to 1000 miles was announced recently by the Engineering Products division, Radio Corporation of America.

The 51-page booklet contains photographs, cutaway drawings, floor plans, and technical data "to acquaint communications engineers who are planning fixed or mobile microwave stations, or extensions of existing systems, with the design features and installation flexibility of RCA microwave equipment."

Coverage of the booklet ranges from basic RCA "building block" microwave and multiplexing equipment, which can be assembled in numerous combinations, to typical system layouts, buildings and antennas.

Entitled, "RCA Microwave Radio Relay Communications Equipment," the booklet is available on request from RCA Engineering Products Div., Camden, N. J.

Raytheon announces low-cost microwave

A new low-cost microwave communications link recently announced by Raytheon Manufacturing Co. promises to find widespread application in both gas transmission and distribution company operations. Because of its simplicity and ease of installation the new unit, known as "Telelink," may be used for short-haul, single-hop communications between any two outlying installations, as a lateral to tie a company's outlying office or installation into a mainline circuit or for a number of other similar purposes.

According to Raytheon spokesmen, Telelink is the lowest priced unit of its kind ever developed. The entire unit, including a built-in antenna, is housed in a single metal box that may be mounted atop a pole or tower. It may also be placed at the foot of a tower with the beam directed upward to a reflective antenna.

The unit operates directly from power line voltage and contains its own thermostat-controlled ventilating system. One- or two-channel service is available with full selective ringing. Output is 100 milliwatts in the 6000 mc. band.

Announcement of this unit marks Raytheon's entry into the field of microwave communications. Another microwave system for industrial use is soon to be announced, according to company spokesmen.

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Why take less when you can get more?

. . . (and at the same price)

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- ★ They save pipe.
- ★ They often eliminate short nipples and their extra welds.
- ★ They save time and money in lining up and clamping pipe and fitting.
- ★ They make it easier to apply slip-on flanges.
- ★ They remove the circumferential weld from point of maximum stress and can be sleeved.
- ★ THEY COST NO MORE THAN OTHER ELBOWS.

As shown in the illustration above, Midwest "Long Tangent" welding Elbows have straight ends equal to ¼ of the nominal fitting diameter (a 12" elbow has tangents 3" long). For the reasons listed at the left, substantial savings are made on many piping systems by using Midwest "Long Tangent" Elbows. For more information about them, write for Catalog 54.

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PIPELINE NEWS

Gas and oil committee to inform public on affairs

An information program designed to present facts to the public on the development of adequate resources of natural gas and oil will be conducted by a newly-created Natural Gas & Oil Resources Committee. L. F. McCollum, president of Continental Oil Co. is chairman and Paul Kayser, president of El Paso (Texas) Gas Co., is vice-chairman. Baird H. Markham, former director of the American Petroleum Industries Committee, will serve as full-time director of the committee.

The purpose of the new information program will be to acquaint consumers and the public at large with the full story of the efforts to meet the rapidly rising demand for this form of fuel and energy.

With particular reference to the natural gas industry, Mr. McCollum pointed out that with the construction in the last few years of numerous long distance transmission lines from fields in the Midcontinent and Southwest areas, natural gas for the first time was being used by a large segment of the public which was unacquainted with the problems which are confronted in developing new supplies to satisfy the growing demands of consumers.

He stated that new consumers as well as others have a great stake in knowing the facts with respect to their future gas supply and the Committee plans to present these facts to interested groups throughout the country as well as to the public at large.

The Committee will have its headquarters in the Empire State Building, New York City, New York.

Texas-Ohio withdraws one proposal, plans another

It is reported that the newly reorganized Texas-Ohio Gas Co. has withdrawn an appeal to the courts against the FPC's denial of its former proposal to supply natural gas to Ohio and adjoining areas.

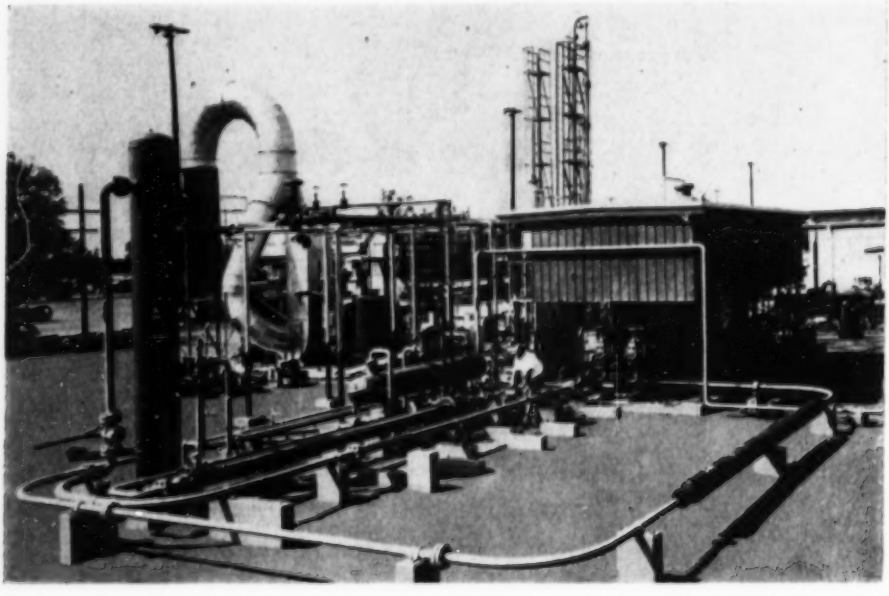
According to President P. M. Biddison, the company now contemplates building a line from Texas, Louisiana, and Mississippi gas fields to serve Florida, eastern Georgia, and the eastern Carolinas. Initial capacity would be 300 MMcf of gas per day. Not under consideration at this time is the possibility of obtaining gas from Mexico, a source claimed for the original project.

Fluor opens new research center in California

The Fluor Corp. Ltd., Los Angeles, recently climaxed plans which began in 1941 when the company initiated a modest research program. A two-day celebration marked the occasion of the opening of the company's new research division in Whittier, Calif.

The building is comprised of 17,000 sq ft of air conditioned office and laboratory space in addition to two acres devoted exclusively to pilot plant construction and operation. Working facilities include laboratories equipped for research in many engineering and processing phases, a machine shop, photographic dark room, and stock rooms.

At the rear of the site is the physical engineering laboratory for testing large equipment used in the processing industries. Present projects in operation here include a pilot compressor station, a plant for fertiliner study, a solvent extraction test plant, evaporative cooling test apparatus, and a unit for checking performance of heat exchangers.



The compressor facility at Fluor's new research center provides a flow of high pressure gas which can be used in study of gas compressor problems, such as pulsation dampening. For test purposes, a 175-hp Clark gas engine-driven compressor is used. A small Ingersoll-Rand compressor is used to raise fuel gas from main pressure to 30 lb entering the Clark compressor. This small compressor is also used to pressurize to 850 psi the entire system for pulsation dampener test.

Northern plans $56 million line for Canadian gas

Northern Natural Gas Co., Omaha, has asked the FPC (Docket G-4259) to approve its $65 million construction program for 1955, which will include a pipeline to tap Canadian gas reserves and an extension of service to North Dakota and Wisconsin.

Facilities to carry the Canadian gas, which has been contracted for with TransCanada Pipe Lines Ltd., would include 188 miles of 24-in. line, 215 miles of 30-in. line and a 6000-hp compressor station, at a total estimated cost of $56,687,000.

The 25-year contract with TransCanada calls for initial deliveries of 100 MMcf per day beginning Oct. 27, 1955 by TransCanada to a point on the west side of the Red river at the international boundry, almost due south of Winnipeg. An additional 50 MMcf of gas daily is planned for delivery beginning Oct. 27, 1956, and further amounts of 50 MMcf per day are scheduled for each of the following three years, dependent upon gas being made available and upon permits being secured.

The 24-in. line would carry the gas from the Red river area along the Red river valley to Wahpeton, N. D. From there the 30-in. line would carry the gas to Northern's system.

Pipeline contractors to meet in Los Angeles

Preliminary plans for the first convention of the Pipe Line Contractors Association to be held outside of the Southwest have been announced. The 7th annual convention of the group will be held at the Statler hotel in Los Angeles, Jan. 16-19.

The 1955 convention will have an international tone with two Canadians among the list of speakers. One session will feature a discussion of laws and regulations governing the operation of pipeline construction in Canada.

Three events on Sunday, Jan. 16, will precede the formal opening. These are a noon luncheon, a board of directors meeting, and a cocktail party for executive officials and wives of association contractor members.

Association President G. A. Manuel, Wi-

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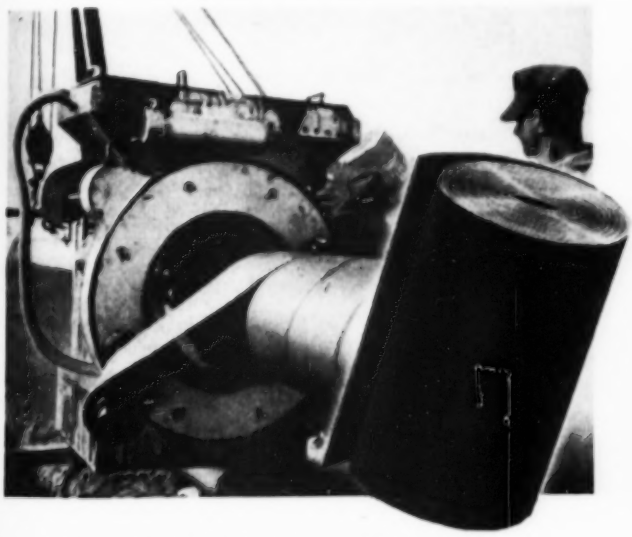

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liams-Austin Co., will preside at the opening session Monday morning. At the afternoon session, R. A. MacKimmie, of a Canadian law firm, will speak on the laws and regulations governing pipeline construction methods on 34 and 36-in. pipe.

Closing the session will be a talk by Frederic A. Hough, chairman of ASA Subcommittee 8, on the activities of the committee that is preparing a code for high pressure gas piping.

The Tuesday morning session will open with a talk on the outlook for pipelining in Canada by N. E. Tanner, president of Trans-Canada Pipe Lines Ltd. A panel discussion on safety in pipeline construction will follow.

Among many social events is the annual banquet, which will be highlighted by the introduction of new officers.

Concluding the convention will be a meeting of the board of directors, at which committee appointments will be made and general business will be transacted.

Cities Service to sell Arkansas Louisiana Gas

Cities Service Gas Co. has filed an application with the Securities and Exchange Commission in which it is revealed that Mississippi River Fuel Corp. is expected to acquire control of the production, gathering, and extraction facilities of Arkansas Louisiana Gas Co.

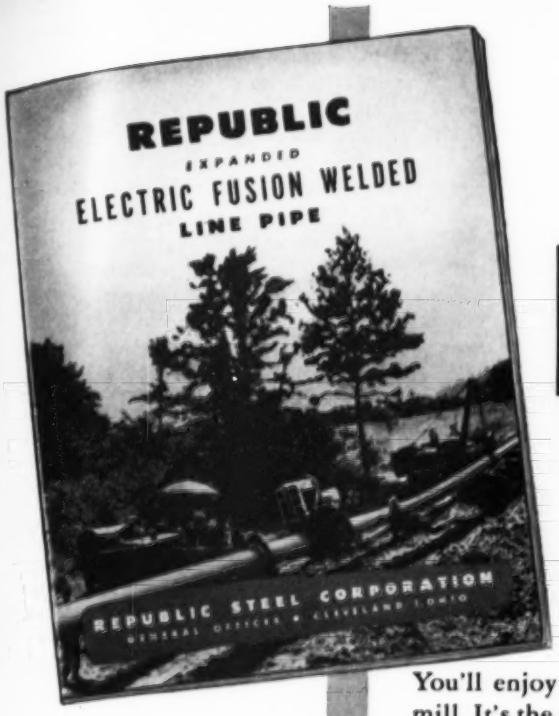
It is Cities Service intention to sell 51.5% of the shares of Arkansas Louisiana's par common to W. R. Stephens Investment Co., Little Rock. Once the transactions are completed, Stephens would use its "best efforts" to get Arkansas Louisiana to transfer its production, gathering and extraction facilities to a still-to-be-organized company. The stock in the new company would be distributed to stockholders of Arkansas Lousiana. After that the Stephens firm would sell its holdings in the new company— amounting to control—to Mississippi River Fuel. Subsequently, Stephens would also dispose of all its shares of Arkansas Louisiana.

If the proposal is approved, Arkansas Louisiana would retain its distribution facilities, which serve some 225,000 customers in northern Louisiana, eastern Texas, and part of Arkansas.

French pipeline uses American equipment

American equipment is being used to clean French gas on the newest and longest French gas transmission line, the major portion of which was completed in October.

Blaw-Knox Co., Pittsburgh, supplied a number of gas cleaners, ranging in size from 18- to 60-in. diameter, to Gaz de France, the nationalized gas industry. The cleaners were installed at compression and reducing stations along the 380-mile line, which connects



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the coal- and steel-producing areas of the Saar and Lorraine with Paris.

Blaw-Knox also supplied Gaz de France with a portable oil fogger for tests aimed at finding methods for reducing gas leakage.

The new transmission line was built to utilize the surplus coke oven gas from the Saar and Lorraine. In addition to supplying the Paris area, the line serves a number of towns and villages along the way.

At Blenod, where two main feeder lines merge, a 60-in. gas cleaner handles approximately 56 MMcf of standard gas per day at 750 psi. Another 60-in. cleaner operates at the delivery end of the line near Paris at 850 psi, handling about 43 MMcf a day. A booster station will eventually be constructed about half way between Blenod and Paris, making possible inccreased deliveries of gas.

Smaller B-K gas cleaners are installed at feeder lines to consumer areas. Additional units are slated for industrial customers requiring extremely clean gas, such as glass factories.

France faces quite a corrosion problem because of the higher sulfur, carbon dioxide and moisture content of the coke oven gas. In addition, vapor phase gums have caused considerable trouble in burners, regulators and meters.

Another problem that the French gas industry hopes to solve is that of gas leakage. The French Gas Board is presently testing a Blaw-Knox portable fogger for possible application in the various gas systems of the country.

The amount of gas lost by leakage through dried out gaskets in European gas systems has been observed to be as high as 50% of the total gas sendout. Oil foggers provide an oil fog that travels through the entire distribution system, saturating rubber gaskets and keeping pipe deposits moist.

Big Horn purchases okayed for Montana-Dakota

Certificates have been granted to eight independent natural gas producers authorizing them to make sales to Montana-Dakota Utilities Co., Minneapolis. The FPC at the same time approved the construction and operation by Montana-Dakota of pipeline facilities in Wyoming and Montana (Dockets G-2382 et al).

Montana-Dakota's facilities will enable the company to purchase additional natural gas in the Big Horn basin in Wyoming from the eight producers, and to sell natural gas to the Montana Power Co., Butte. The producers will sell surplus residue gas from a proposed plant which they will operate in Big Horn county, Wyo., for the recovery of liquid hydrocarbons and residue gas.

Montana-Dakota will build 4 miles of pipeline in Big Horn county, and a metering station in Carbon county, Mont., to measure the gas to be sold to Montana Power. In addition, Montana-Dakota was authorized to lease and operate a 2640-hp compressor station in Big Horn county, Mont., to be constructed by Montana-Wyoming Gas Pipe Line Co., also of Minneapolis. Montana-Dakota will deliver an average of 10 MMcf of gas per day to Montana Power for any one year, but no more than 15 MMcf in any one day.

Transco and TGT seek $13 million in increases

Six requests for higher rates highlighted the rate scene recently. Transcontinental Gas Pipe Line Corp., Houston, asked the FPC for a $3,204,000 (5.4%) raise; Tennessee Gas Transmission Co., also of Houston, is seeking a $9,754,000 (7.7%) raise, substituting this increase for a previously requested $1.1 million hike.

TGT's request resulted in the following applications: Alabama-Tennessee Natural Gas Co., $74,000; United Fuel Gas Co., $2,668,000; Central Kentucky Natural Gas Co., $461,000; and Atlantic Seaboard Corp., $755,000.

In allowing Texas Illinois Natural Gas Pipeline Co., Chicago, a $2,941,107 increase (about half of what was originally requested), the FPC added a condition relating to the company's estimate of the cost of purchased gas. The company estimated that

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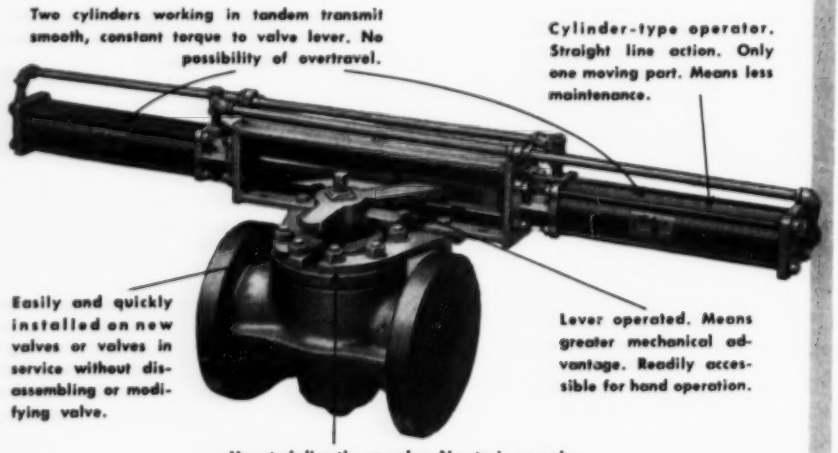
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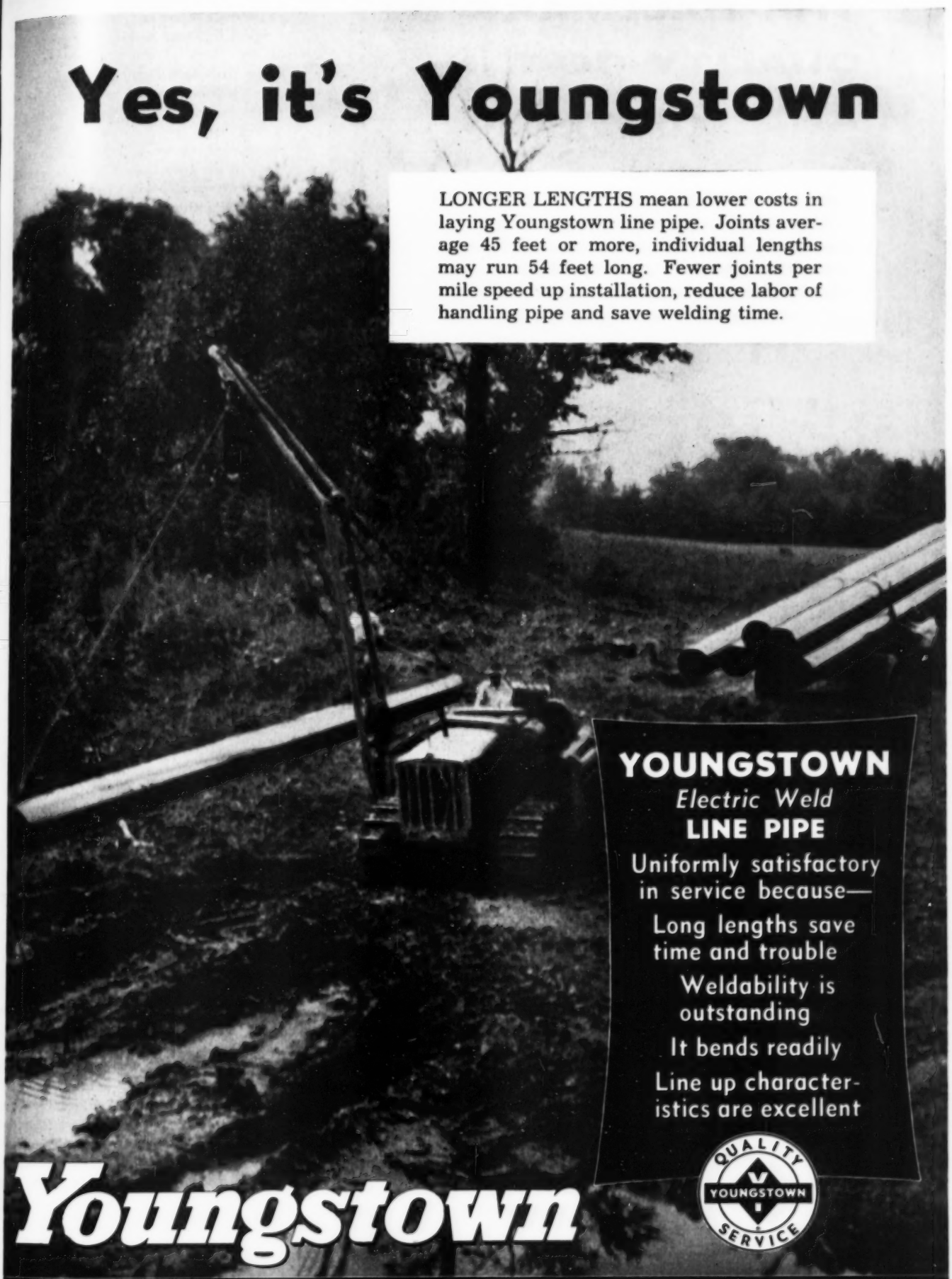

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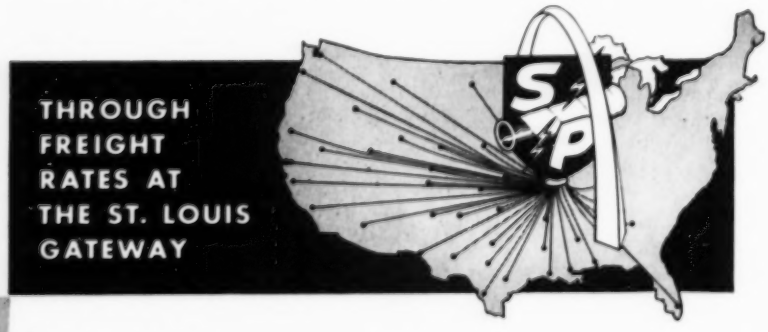

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its purchase in the La Gloria field would be deficient by about 50 MMcf of gas per day during 1954 and that it would thus be necessary to make spot purchases of higher priced gas. Examiner Marsh therefore conditioned his decision to allow rates based on the estimated deficiency but to provide for appropriate refunds to Texas Illinois customers in the event total deliveries from La Gloria exceed 35 MMcf per day.

The FPC also allowed, subject to refund, a $12,589,000 boost requested by Cities Service Gas Co. and suspended Southern Natural Gas Co.'s $7,018,000 increase.

Texas commission orders recycling in La Gloria

The Texas Railroad Commission has entered the controversy on whether individual states have the right to exercise conservation authority over natural gas production by ordering operators of 17 reservoirs in the La Gloria field to put all the gas they produced back into the ground after removing the liquid hydrocarbons.

Under commission authority, La Gloria operators have been permitted for 14 years to recycle gas. Some of them have been doing so, and this has reduced the amount of gas available to transmission companies. As a result of the Phillips decision, producers petitioned the commission to order the La Gloria gas cycled, rather than merely permitting cycling. The commission's order prohibited the production of natural gas from any of the reservoirs unless it is reinjected.

Texas commissioners, although conceding that this action helped the producers in their dispute with the pipeline company, contended it was primarily a conservation measure to prevent waste.

Compromise agreement reached by Transco and TGT

Transcontinental Gas Pipe Line Corp. and Tennessee Gas Transmission Co., both of Houston, have agreed to compromise competing applications to serve six customers in the New York-New Jersey market area (Dockets G-2331 and G-2367).

Tennessee last January filed an application requesting authorization to construct and operate natural gas transmission facilities to provide additional service to existing customers and to serve new customers in New Jersey and metropolitan New York. Transcontinental filed a competing application in which it sought authorization to build and operate pipeline facilities to enable it to increase by 93,490,000 cu ft per day natural gas deliveries to customers in the same area.

In their proposed settlement, reached after a series of conferences, the two firms agree to divide the market and to serve together at least six customer companies, five of which are in New York—Brooklyn Bor-

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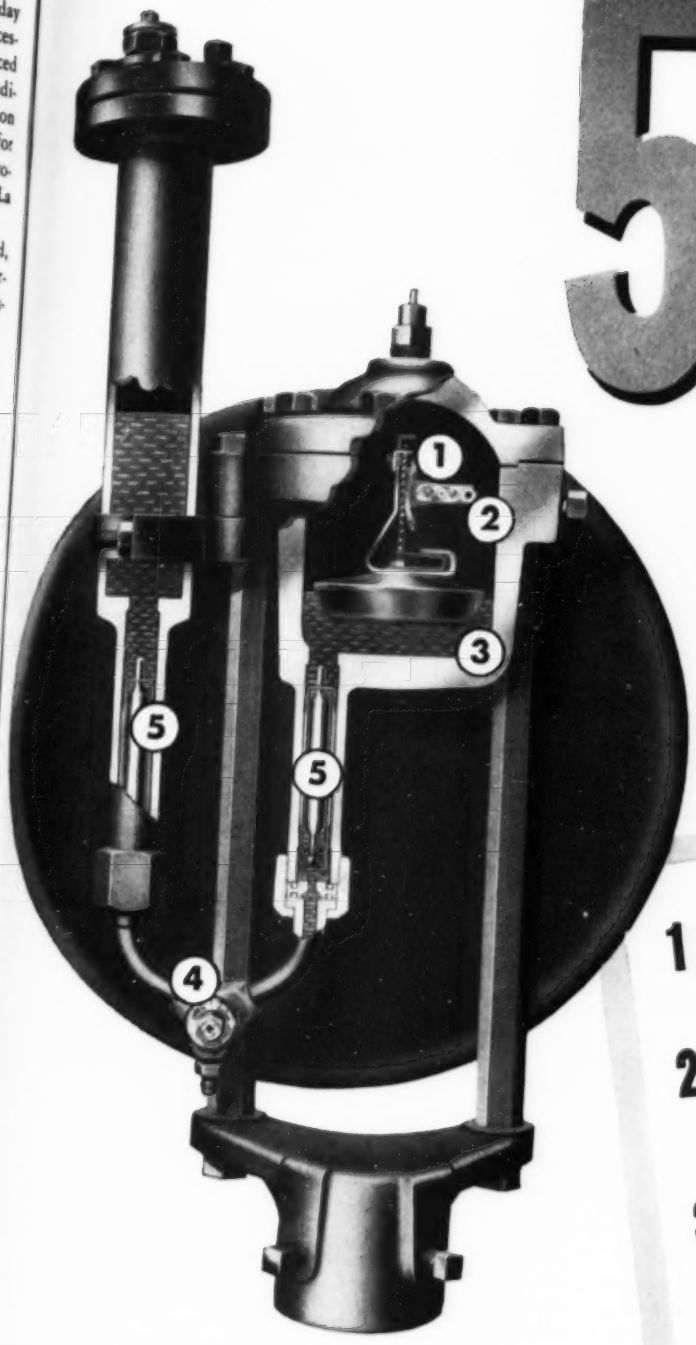

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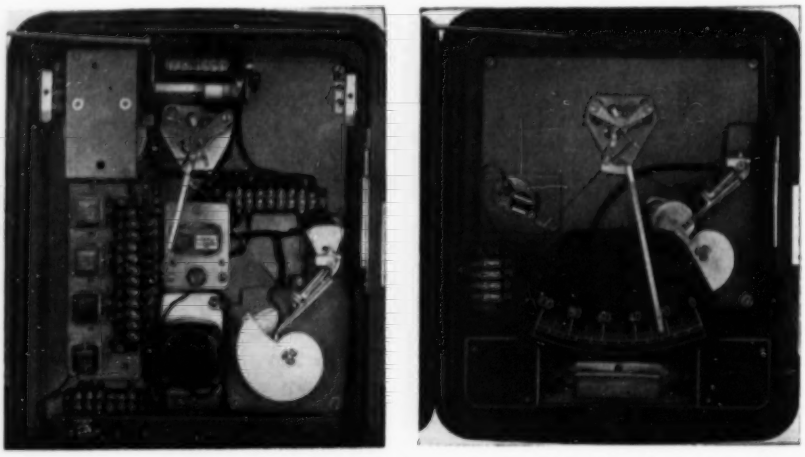


Interior views of the receiver (left) and transmitter of Foxboro's new impulse-duration telemetering system.

Impulse-duration system handles long distance measurements

A NEW impulse-duration telemetering system that transmits and receives long distance measurements of process flow, pressure, liquid level, temperature and other variables has been introduced by the Foxboro Co., Foxboro, Mass.

150-mile span

Designed for reliable transmission of measurement in applications such as reservoir level, natural gas line flow and pressure, and intra-plant control systems, the Foxboro Teletax telemeter can handle distances up to 150 miles by wire or may be operated over radio link or microwave channels.

Because the system operates as a function of pulse duration, the signal level can vary widely without affecting operation or accuracy. At 12-second intervals the telemeter transmitter sends a pulse to the receiver proportional in duration to the variable being measured. The receiver automatically compares the duration of this pulse to that of the previous one and actuates a reversible motor which positions a recorder pen or indicator pointer to reflect any measurement change.

The system uses relatively few moving parts, each of which is easily accessible and can be serviced without special tools. Transmitter, receiver and power pack units are enclosed in rectangular metal cases. Plug-in receiver relays and mercury type switches are used for safe, reliable service.

The Foxboro telemeter exemplifies the inherent simplicity and reliability of the impulse-duration type of telemeter. No vacuum tubes are used. Relays are of the plug-in type enclosed in dust-proof plastic containers. Mercury switches are used for safe, reliable service. All linkages, as well as recording or indicating mechanisms, are the same as are used in standard Foxboro measuring equipment.

Two pulses

The telemeter is an electromechanical system in which any difference in the duration of two pulses produces a signal which positions the pen or pointer in the receiver. One of the pulses originates in the transmitter and travels over the transmission line to the receiver. The other pulse originates in the receiver, and once every 12 seconds is compared in duration to the pulse received from the transmitter. When the measured variable remains constant, the pulse durations are equal and no positioning signal is produced at the receiver.

The transmission may consist of an ac or dc signal over a signal pair of leased lines or private wires, or a frequency signal over radio link or microwave system. In some applications one wire and ground return may be used.

ough Gas Co., Brooklyn Union Gas Co., Consolidated Edison Co .of New York, Kings County Lighting Company of Brooklyn, Long Island Lighting Co., of Mineola, N. Y., and Public Service Electric Gas Co., Newark.

Under the proposed agreement, Tennessee would deliver the following daily quantities of firm gas: Brooklyn Union, 20 MMcf; Consolidated Edison, 25 MMcf; Long Island Lighting, 5 MMcf; Public Service, 25 MMcf. The settlement also provides an option through which the four customer companies could purchase fixed quantities of "storage option" gas from Tennessee's existing and proposed new storage fields in Pennsylvania and New York.

Five customer companies would, under the compromise plan, buy the following daily quantities of firm gas from Transcontinental: Brooklyn Borough, 1 MMcf; Brooklyn Union, 5 MMcf; Consolidated Edison, 5 MMcf; Kings County, 500 Mcf; Public Service, 25 MMcf.

The agreement specifies that Transcontinental will construct a 24-in. pipeline extending from a point to be located on Tennessee's proposed Hebron, Pa.-Greenwich, Conn., line, to a point of connection with Transcontinental's existing 30-in. pipeline near Paramus, N. J. Tennessee has agreed not to construct a lateral line which it had proposed to build from a point on its proposed Hebron-Greenwich line to a point at or near Harrison, N. J.

Transcontinental would transport for Tennessee, through this joint interconnection, up to 25 MMcf of firm pipeline gas per day and up to 30 MMcf of storage gas daily for delivery to Public Service. Transcontinental would also transport for Tennessee, through its existing 10-in. lateral line, gas to Public Service's Paterson Works. Tennessee would pay Transcontinental a transportation fee totaling $200,000 per year for this service.

J & L Steel operating new finishing facilities

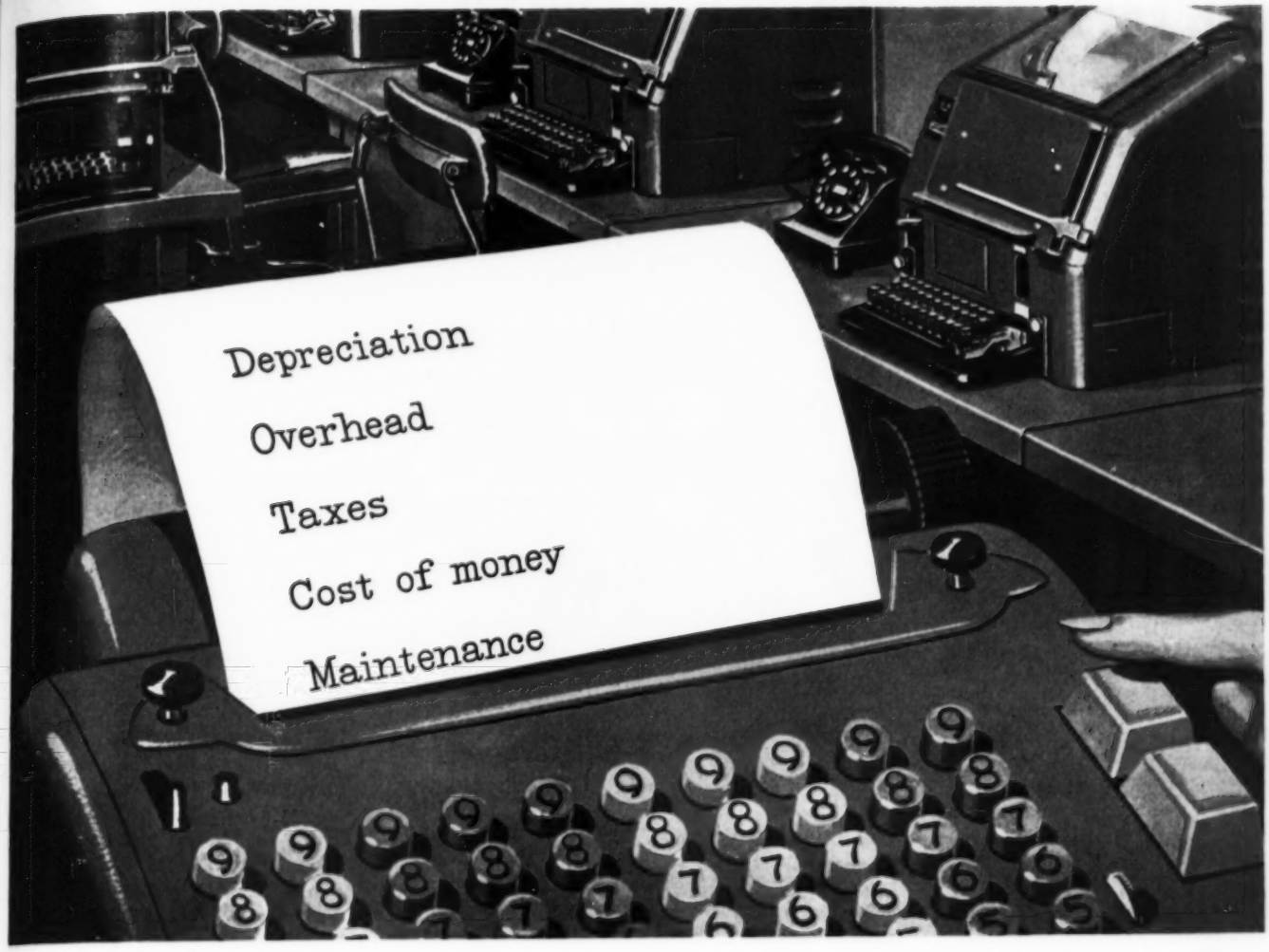
New finishing facilities for producing oil country tubular products in the high strengths necessary for deep drilling are now in operation at Jones & Laughlin Steel Corp.'s Aliquippa works.

The new facilities, housed in a 100-ft by 725-ft steel structure with corrugated siding, is the first step in expansion of facilities for finishing high strength and special seamless tube products used in the oil industry. Further expansion of these facilities will come under J & L's plans for a $51 million expenditure on this project and others in 1955.

Transco agrees to withdraw $5.6 million rate increase

A settlement has been reached of a rate proceeding under which Transcontinental Gas Pipe Line Corp. will withdraw a proposed $5,657,662 annual increase in its rates.

The proposed increase was filed by Transco last April 30 and was suspended May 27, pending hearing and decision. Transco sub-



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_____ G-5

mitted the proposed settlement during the hearings. Transco had submitted to the commission on Aug. 30 certain revised tariff sheets, to become effective Sept. 1, to comply with a condition of an earlier rate case settlement approved by the commission last December. The proposed revisions reflect an annual reduction in costs of $713,819 due to the Texas gathering tax invalidation together with an increase in costs of $279,846 resulting from the Sept. 1 increase in the Texas production tax.

One of the conditions of the settlement is that the revised tariff sheets filed Aug. 30 be permitted to become effective as of Sept. 1.

Transco had based its proposed rate increase largely on increased gas purchase costs resulting from renegotiation and escalator clauses in gas purchase contracts. The settlement also provides that Transco must make certain modifications in its rate schedule provisions, proposed in the April 30 filing, concerning unauthorized overrun penalties.

FPC acts on rate boosts sought by independents

Rate increases of independent natural gas producers numbering 238 and amounting to about $8,121,928 per year received no action from the FPC and thus became effective Nov. 1, their proposed effective dates. However, numerous other requests for increases were suspending, pending hearing and decision.

Of the increases that went into effect, some of the largest affect Tennessee Gas Transmission Co., Houston. These include: The Chicago Corp., $2,186,304; A. C. Glassell Jr. et al., of Houston, $1,163,126; C. H. Lyons Sr. et al., Shreveport, $187,462; E. J. Hudson, et al. Shreveport, $142,300; W. H. Foster, et al., Dallas, $87,268; and Placid Oil Co., Shreveport, $148,300.

Among the suspended cases were the following: Union Oil Co., Los Angeles, $2,465,000; Phillips Petroleum Co., $178,784; M. H. Marr, Dallas, $2400; Delta Gulf Drilling Co., $2678; Taylor Oil & Gas Co. and Mayfair Minerators Inc., $30,767; Humble Oil & Refining Co., $21,599; Arnold O. Morgan, $24,000; Arkansas Fuel Oil Corp., from 10.246 cents per Mcf to 12.12268; Bridwell Oil Co., $14,000; Wunderlich Development Co. $43,800.

Abandonment of sales approved by FPC

Abandonment by an independent producer of sales to one company and sale of the gas to another company at a higher price, according to agreements between the three companies, has been approved by the FPC.

The producer is Lone Star Producing Co., whose contract provides for the sale of gas to Tennessee Gas Transmission Co. and Iroquois Gas Corp. The rate schedule and

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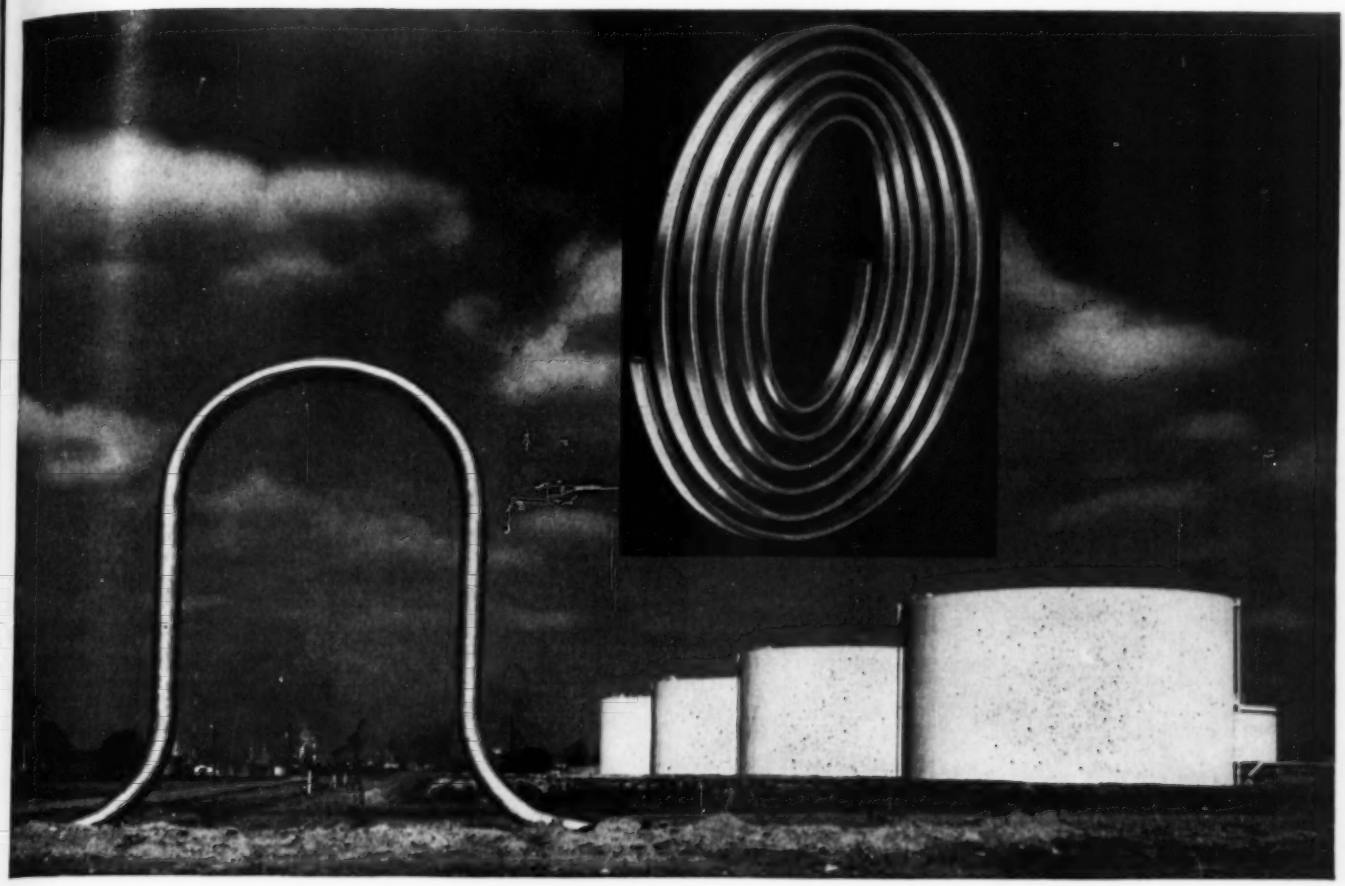

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Given reasonable conditions, Galvo-Line can be installed at rates upward of 3,000 feet per hour—the equivalent of installing 35 Galvo-Paks® in the same time. Connection-making costs are also reduced—one connection every 500-1000 feet will usually suffice. Uniform distribution and efficient utilization of current contributes greatly to Galvo-Line's economy and dependability in galvanic pipeline protection.

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supplements of Lone Star governed the sales to TGT as of June 7, 1954. The effective rate was then 13.37125 cents per Mcf. The FPC order said it is the intent of the three parties that the sales to TGT, which were proposed to be made for a limited term only, be terminated Oct. 31 and thereafter, commencing Nov. 1, as provided in Lone Star's rate scheduled and its supplement, the gas will be sold to Iroquois for resale. The supplement provided that the price to be paid by Iroquois to Lone Star shall be 16.50 cents per Mcf.

The FPC approved the proposal on condition that TGT file a statement that it has no objection to the abandonment of the service to it by Lone Star and that such abandonment will not adversely affect its sales and operations.

Gathering system plans go before Alberta board

Public hearing was scheduled to begin Nov. 23 before the Alberta Conservation Board on an application by Alberta Gas Trunk Line Co. Ltd. to construct gas gathering system in the province to meet Alberta's requirements and the export needs of Trans-Canada Pipe Lines Ltd., which will move the gas eastward.

The proposal calls for a 130-mile line starting at the south end of the already constructed Edmonton-Bonnie Glen line and running south to a point about 10 miles northeast of Calgary. From Calgary, the line would run 80 miles southeast to Bassano and from there 130 miles east to the Saskatchewan boundary, where it would connect with the Trans-Canada line. Gas would be gathered from the Bonnie Glen, Westerose, South Westerose, Homeglen-Rimbey, and Cessford gas fields.

Although branch lines will eventually be required to connect with the Pincher Creek, Hamilton Lake, Provost-Consort and Sib Ald fields, Alberta Gas plans only to construct the mainline.

Additional storage sought by TET and New York State

Texas Eastern Transmission Corp., Shreveport, and New York State Natural Gas Corp., Pittsburgh, Pa., have asked the FPC for authority to construct, operate and acquire additional underground natural gas storage facilities as part of their joint Oakford storage project in Westmoreland county, Pa. (Docket G-2784).

The two companies propose jointly to construct and operate additional field pipelines and to connect up additional wells in the Murrysville pool; to acquire a 2000-hp field gathering compressor station from the Peoples Natural Gas Co., Pittsburgh; and to install an additional 1980-hp at the station to be acquired from Peoples.

Total estimated cost of the proposed construction is $726,300, and in addition the companies would pay $433,744 to Peoples for the compressor station.

Oklahoma's minimum price law scheduled for review

Decisions upholding Oklahoma's authority to fix minimum prices for natural gas will be reviewed by the Supreme Court, following the appeal of the Natural Gas Pipe Line Co. of America, Michigan-Wisconsin Pipe Line Co., and Panhandle Eastern Pipe Line Co.

The companies contend Oklahoma invalidated the jurisdiction of the FPC to regulate natural gas sales. The Oklahoma regulation says no gas may be produced in the Guymon-Hugoton field at less than 9.8262 cents per Mcf.

North Dakota Natural enlarges service plans

North Dakota Natural Gas Transmission Co., St. Paul, Minn., has filed an amended application with the North Dakota PSC cal

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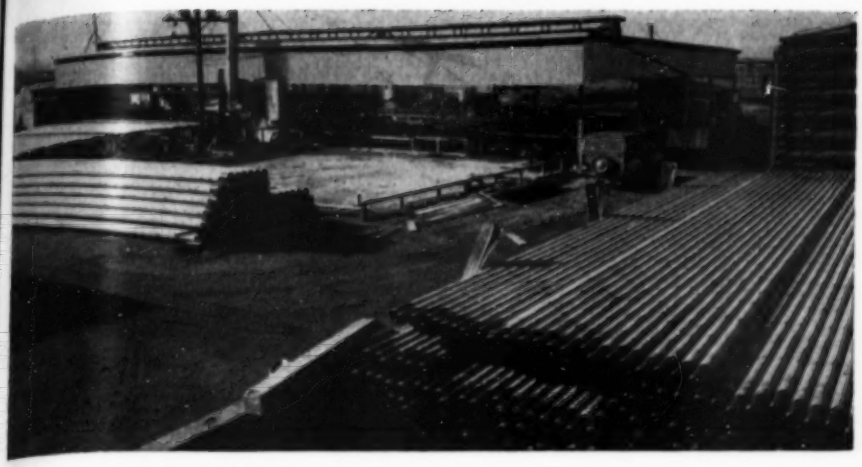

Pipe from Colorado steel pipe mills, as well as from the east and far west, will be processed in the new Denver plant of Hill, Hubbell & Co. One of the first companies to factory-wrap and coat pipe, Hill, Hubbell has located its new plant, reportedly the largest of its kind between Chicago and the Pacific Coast, on a 20-acre site in Denver.

ing for gas service to 21 North Dakota cities instead of nine as proposed in the company's original application (see GAS, January, page 114).

Originally planning to serve Stanley, Minot, Velva, Harvey, Carrington, Jamestown, Fargo, Devils Lake, and Grand Forks, North Dakota Natural now proposes to add the municipalities of Berthold, Drake, Anamoose, Fessenden, Sanborn, Valley City, Tower City, Casselton, Southwest Fargo, Sheyenne, New Rockford, and Larimore.

The new plan would bring the estimated construction cost to $11,017,200 and would include off-peak industrial sales to Northern States Power Co. at Fargo, Grand Forks and Minot; Otter Tail Power Co. at Jamestown and Devils Lake; Valley City Municipal Utilities and the Voltaire plant of Central Power Electric Co-op Inc.

Treasure State's boost in Canadian deliveries okayed

The Federal Power Commission has issued an order (Dockets G-1982, et al) permitting Treasure State Pipe Line Co., Great Falls, Mont., to increase its previously authorized exports of natural gas to Canada by 40 MMcf per year.

The commission by orders issued in 1952 and 1953 had authorized the company to export a maximum of 80 MMcf of natural gas annually for use in Coutts and Milk River, Alberta. The new order amends these earlier authorizations to permit the export of a total of 120 MMcf per year.

Int its application requesting the increase, the company said that the Petroleum and Natural Gas Conservation Board of Alberta had indicated that it would not permit the installation of a gas system to supply Milk River unless an additional 40 MMcf of gas was authorized for export.

FPC names Henry Domers to new commission post

Henry R. Domers has been named to fill the newly created position of executive officer of the FPC.

As executive officer of the FPC, Mr. Domers will assist the chairman in carrying out the executive and administrative functions of the commission. He also will assist

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You actually get two Pigs in one when you use WILLIAMSON DUBL-DIAMETER PIGS . . . and you'll realize a big saving in manpower and operating costs because fewer scraper traps are needed. These Pigs are designed for efficient cleaning of multiple sizes of pipe and are now in use on oil, products and gas lines of many sizes . . . for instance, a DUBL-DIAMETER Pig regularly scrapes a 50-mile line which consists of 16" and 18" pipe, *including an 8-mile crossing of Galveston Bay.*

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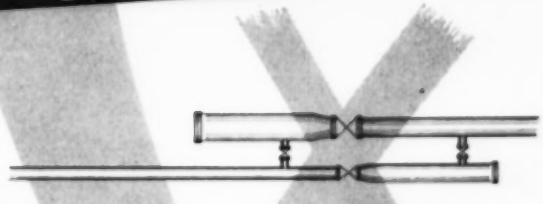

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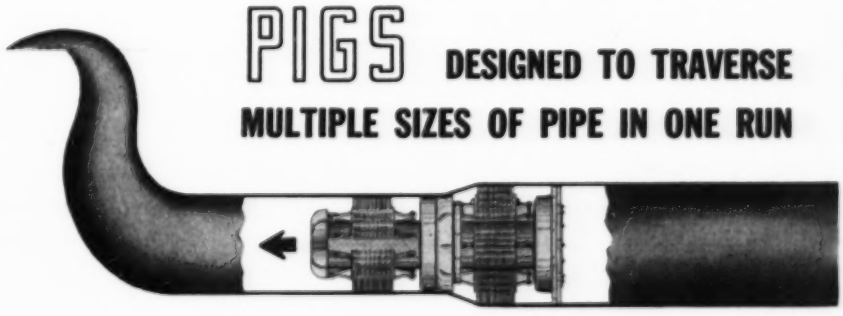

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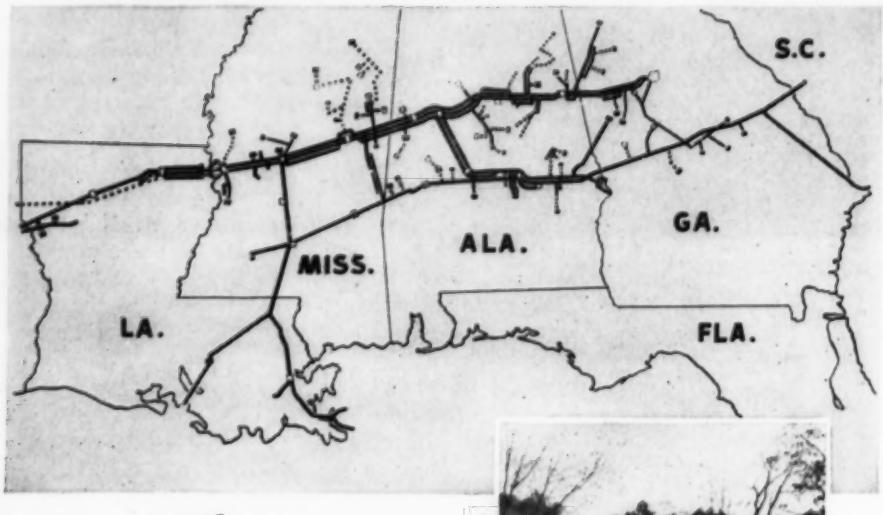

MILES OF PIPE

at end of	miles
1947	1899
1948	2120
1949	2218
1950	2625
1951	2840
1952	2970
1953	3855

Glass Fibers Inc. is proud to number Southern Natural Gas Company among its valued customers

GLASS FIBERS INC. congratulates forward-looking Southern Natural Gas Company on its vigorous pipeline expansion program. As is well known, the cost of constructing an underground pipeline is tremendous. The cost of repairing or replacing it is sometimes even greater. Yet, for less than ½ of 1% of the original investment, Blue Flag-reinforced enamels will preserve a pipeline for years beyond its normal life. For a new folder on Glass Fibers' pipe wraps, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

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the commissioners in program development and will manage the work activity of the FPC's staff.

Pipeline Notes

The Houston (Texas) steel pipe mill of the A. O. Smith Corp. of Texas has been shut down because of a lack of orders. The shutdown is partly traceable to delays in getting started on an order for more than 300,000 tons of 30-in. pipe from American Louisiana Pipe Line Co., which is seeking to build a line from south Louisiana to Michigan and Wisconsin. About 200 production workers have been laid off for "at least two weeks," according to the resident manager.

Northern Natural Gas Co., Omaha, has asked the FPC to issue an order directing that J. M. Huber Corp. desist from discontinuing or curtailing deliveries of natural gas to Northern.

Canada's output of natural gas in the first half of 1954 outdistanced production in a similar period last year. The Bureau of Statistics reports that natural gas climbed to 65,107,621,000 cu ft from 52,376,435,000 in the same period last year.

Pipeline Coating & Engineering Co. recently appointed Frost Engineering Service Co., Los Angeles, as its distributor for southern California, Arizona, New Mexico, and southern Nevada.

On Nov. 16 dedication ceremonies were held at the new home of the Interstate Oil Compact Commission in Oklahoma. Construction costs for the $75,000 building were appropriated by the Oklahoma legislature as a gift to the commission from the reserve built up in the conservation fund by the employment of a tax of ⅛% per barrel of oil and one mill per 10 Mcf of gas produced in the state.

Rules for the proration of natural gas in the San Juan basin for the first time will probably go into effect in the northwestern sector in New Mexico about Feb. 1. Proration is already in effect in southeast New Mexico.

Sulfur extracted from sour natural gas can be taxed like that mined from the earth, the Texas Supreme Court has held. It refused to set aside an Austin Court of Civil Appeals decision that the state tax on sulfur production applies also to brimstone found with natural gas.

Northern Natural Gas Co., Omaha, has been authorized to supply natural gas to Iowa Public Service Co., Sioux City, Iowa, on an interruptible basis for general distribution in Independence, Iowa (Docket

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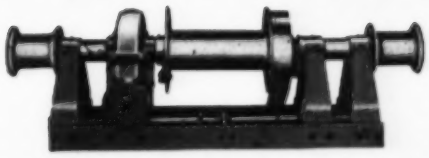

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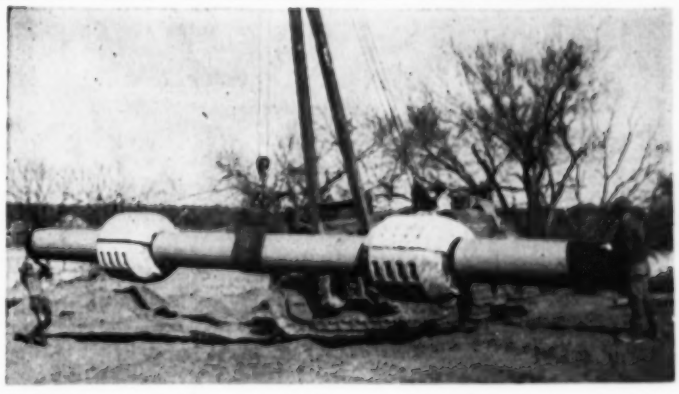
5373 LB. WEIGHTS ON CIMARRON CROSSING

250 Edwards Concrete River Weights, weighing 5373 lbs., each, were used on this Cimarron River Crossing. Note in the photo that there is no deflection of the 20" pipe, even though it is being lifted in the center with 5373 lbs. of weight on either side. This is because of the even weight distribution offered by Edwards Concrete River Weights.



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G-2468). Northern will construct about 2.5 miles of 6-in. branch line and a town border station. Iowa Public Service will construct facilities in Independence.

The new West Seminole natural gasoline plant in Gaines county, west Texas, recently placed in operation by Cities Service Oil Co., is designed ultimately to process 21 MMcf of gas daily from the West Seminole and Russell fields. The new plant is jointly owned by Cities Service, Atlantic Refining Co., Burdell Oil Co., Magnolia Petroleum Co., Superior Oil Co., Sinclair Oil & Gas Co., Shell Oil Co., and Great Western Drilling Co. Cities Service is the operator.

Progress Reports

NEW CONSTRUCTION PLANNED

ALBERTA GAS TRUNK LINE CO. LTD., to build 130-mile gathering line near Edmonton-Bonnie Glen line south to Calgary; 80-mile line to Bassano, and 130-mile line to Saskatchewan boundary to gather and move gas to meet Alberta's requirements and export needs of TransCanada Pipe Lines Ltd.

NATURAL GAS PIPELINE CO. OF AMERICA, Chicago. Docket G-4280 for 260-mile 26-in. line from Fritch, Texas, through southwestern Oklahoma to a point in Grady county, Okla. From there a 90-mile, 20-in. line to Wise county, Texas; total distance: 350 miles, to transport additional quantities of gas to existing mainline facilities.

NORTHERN NATURAL GAS CO., Omaha. Docket G-4259 for 188-mile 24-in. line from international boundary near Red River area to Wahpeton, N. D.; and 125-mile 30-in. line to join system; 6000-hp compressor station to enable company to transport 100 MMcf of gas per day and extend service to North Dakota and Wisconsin.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, and **NEW YORK STATE NATURAL GAS CORP.,** Pittsburgh. Docket G-2784 to construct field pipelines to connect up additional wells in Murrysville pool; acquire 2000-hp field gathering compressor station; and install 1980-hp station.

CURRENT CONSTRUCTION

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 129 miles of 6⅝- to 24-in. line in 12 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana and Texas.

ATLANTIC SEABOARD CORP., Charleston, W. Va. Docket G-2286 for 116.6 miles of 26-in. line in five sections paralleling portions of existing system and addition of total of 4400 hp at two existing and one new compressor station. Western Pipe Line Constructors Inc. contracted for 45 miles of 26-in. from Clendenin to Walkersville, W. Va. Approximately 70 miles complete.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2542 for construction of 1350-hp units at its Welda compressor station; 6 miles of 4-, 6-, and 16-in. pipe in the Colony, South Welda, and North Welda storage fields; and to drill injection and withdrawal wells in these 3 fields.

OHIO FUEL GAS CO., Columbus. Docket G-2464 for construction of 46 miles of line in Jackson, Vinton, Hocking, and Fairfield counties, and 3000 hp in additional compressor facilities at its station in Fairfield county.

OHIO FUEL GAS CO., Columbus. Docket G-2522. 10.6-mile, 20-in. line completed and an 880-hp compressor station under construction. The line would be in the company's Benton storage area, the compressor station in Guernsey county.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 200 miles of 34-in. mainline loops and add 2500-hp compressor capacity to company's 500-mile Topock-Milpitas line. Remains: Associated construction of 7.2-mile, 30-in. and 34-in. and 1.9-mile, 22-in. and 24-in. between Milpitas and Irvington under contract to M&M Construction Co. for construction in 1954.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Construction on 150 miles of 18-in. and 4400-hp station remain for completion in 1955.

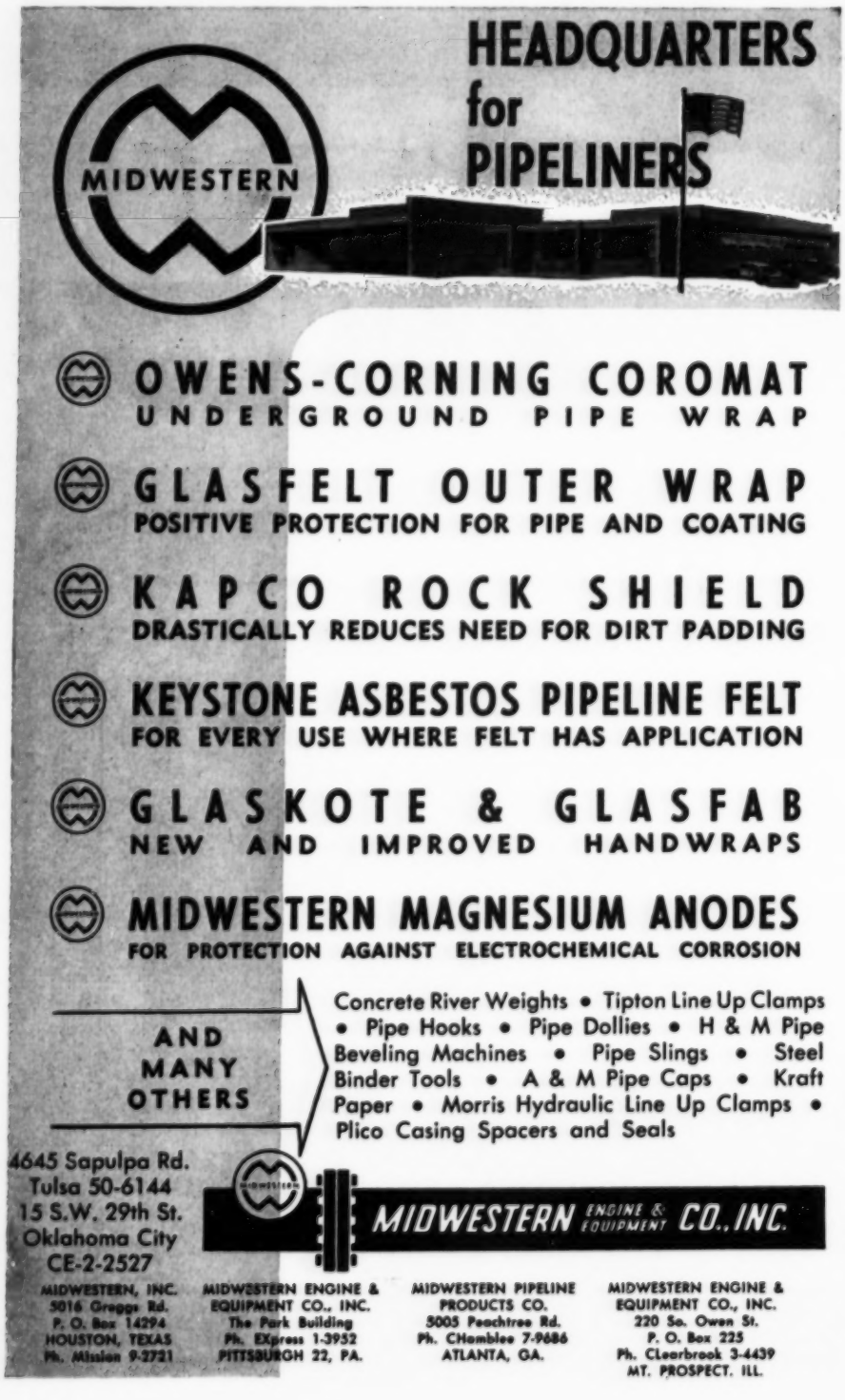
SOUTHEAST ALABAMA GAS DIST., Birmingham. A "U" shaped system of about 330 miles to serve 24 communities in southeastern Alabama from connections with Southern Natural.

TRUNKLINE GAS CO., Houston. Docket G-2402 for two 24-in. Mississippi river crossings in the Greenville, Miss. area. Also 26-in. interconnecting lines to link new crossing with company's system. Missouri Valley Dredging Co. at work on job. Completion expected Dec. 15.

UNITED FUEL GAS CO. and CENTRAL KENTUCKY NATURAL GAS CO., Charleston, W. Va. Docket G-2285 for construction of a 4400-hp compressor station at its storage pool X-59 in Jackson county, W. Va. Also 59 miles of line and 6000-hp compressor station.

CONTRACTS LET

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-2433 for 575 miles of new line (294.6 miles approved), mainline loops, storage, lateral and gathering lines in Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan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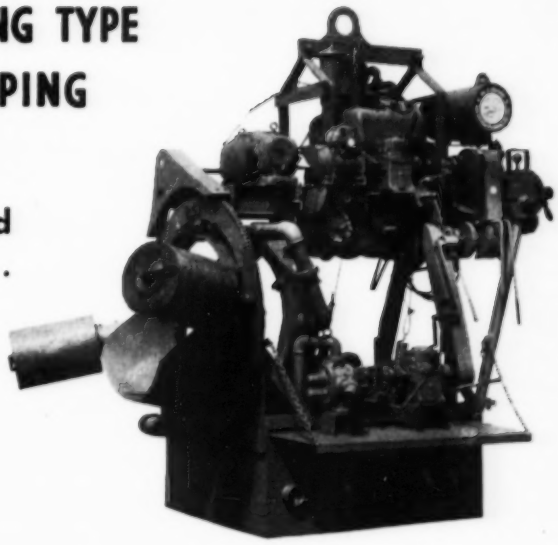

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and 113,000 hp in additional compression. Also includes development of Waverly storage field in Morgan county, Ill. Will increase peak-day delivery capacity from 970 to 1425 MMcf daily. Contractors include: R. H. Fulton Co., 69.5 miles of 30-in.; Midwestern Constructors Inc., 118.1 miles of 30-in.; G. G. Griffis Inc., 26.2 miles 30-in.; O. R. Burden Construction Corp., 32.8 miles of 30-in.; Mahoney Contracting Co., 47.2 miles 26-in.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-2306 to build about 48 miles of 26-in. line between Lake Cormorant, Miss., and Slaughter, Ky. compressor stations; also one 1500-hp compressor station at Covington, Ky. Houston Contracting Co. to lay line.

APPROVED

OHIO FUEL GAS CO., Columbus. Docket G-2495 for 28 miles of new line and a 140-hp addition at an existing station in Ohio.

Pipeline People

ROBERT H. MAHON has been named purchasing agent for Colorado Interstate Gas Co., Colorado Springs. He succeeds C. S. THOMPSON, formerly director of procurement, who has become director of office management.

J. D. DAVIS, superintendent of the western pipeline division of United Gas Pipe Line Co., Shreveport, has been elected a director of the company.

Clark Bros Co., Olean, N. Y., has elected F. H. HAYES, manager of the Houston district sales office, and A. K. HEGEMAN, West coast district manager, vice presidents of the company.

A. K. Hegeman **F. H. Hayes**
Clark Bros. Co.

J. F. Pritchard Co., Kansas City, Mo., has announced several promotions. H. ARTHUR MARTIN is executive vice president; A. RUSSELL YOUNG, W. W. DESCHNER, W. EARL DUNN, and H. M. LOW are vice presidents; KARL E. JOHNSON is vice president and general manager of the J. F. Pritchard Co. of California; and H. R. OGLESBY is vice president and general manager of the Municipal Service Co.

E. S. STEIGNER has been appointed supervisor of the newly organized service engineering department of the Youngstown (Ohio) Sheet & Tube Co.

Four appointments to the staff of Trans-Canada Pipe Lines Ltd., Calgary, have been

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• A while back a couple of us were out hunting and we got caught in a storm that looked like it was going to get pretty bad before it got any better. But we stumbled onto an old shack in the woods that would give us a place to rest out the storm. We got to talking about the feeling of security we got sitting around with the wind and rain blowing outside. Somebody reminded us it wasn't so long ago when a man knew he didn't have any security beyond what he could get with his own thinkin' hustle, and muscle—and luck. And a lot of that luck was like an old darkey on the place used to say, "seems like I always have the best luck with 'taters I hoe the most."

And, you know, it still seems as if about the best chance any man has for security is what he does for himself—and a lot of that is tied up in just doing a job in the right way.

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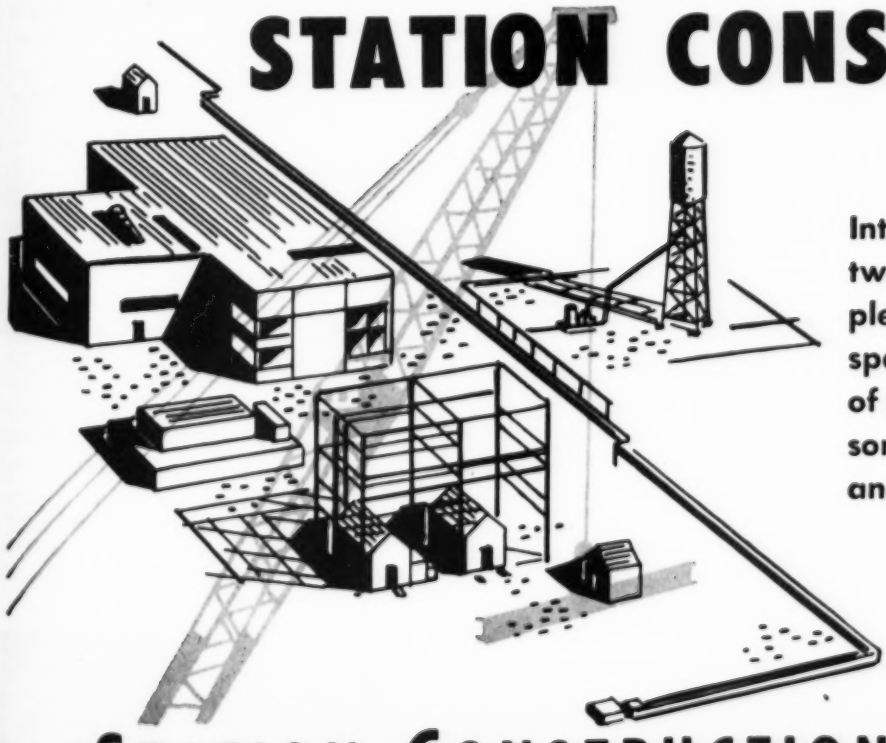

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announced. D. R. PFLUG, formerly of United Gas Pipeline Corp., is chief engineer; R. J. WALLACE, formerly of Transcontinental Gas Pipe Line Corp., is manager of gas supply; DOUGLAS G. SIMPSON is controller and assistant treasurer; and D. W. BROWN is information officer.

WILLIAM R. CURLEY has joined Stuart Steel Protection Corp., Kenilworth, N. J., as midwestern district sales manager in Clarksburg, W. Va.

JOHN M. TUTHILL, assistant general manager of sales for the Youngstown (Ohio) Sheet & Tube Co., has been appointed general manager of sales. The company also announces that P. G. BOYD, Chicago district sales manager, has been named to the newly created post of western manager of sales. C. HIX JONES, Detroit district sales manager, succeeds him, and DAVID H. GOODFELLOW succeeds Mr. Jones in the Detroit position.

Tube Turns, Louisville, Ky., has reorganized its sales departments. Major responsibilities are now handled by: JOHN E. CHUMBLEY JR., assistant general sales manager; THOMAS H. PIKE JR., merchandising manager; JACK W. GREEN, executive assistant; CHARLES F. MORRIS, sales manager of the forgings division; LINCOLN D. HALL, assistant sales manager; ELMER H. DILLEY, manager of general sales office; H. DEWEY GASS JR., manager of the order service department; DAN R. CHEYNEY, assistant manager of the engineering service division; and JACK D. TOLLIVER, assistant manager of the engineering department in charge of pipeline business.

CLARENCE T. DUKE, who has been in the production, purchasing engineering and design departments of the C. Lee Cook Manufacturing Co., Louisville, Ky., has been promoted to sales engineer.

HARRY C. BELL has been named director of engineering for the Ohio Injector Co., Wadsworth, Ohio, and A. A. KRUSE JR., formerly sales manager for the company's Mid-Continent division, moves to the position of chief engineer.

Other appointments at Ohio Injector include VERLAND W. BELT, general superintendent, and NORMAN A. MALONE, chief manufacturing engineer.

A. A. Kruse Jr. **H. C. Bell**
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A pound of gas? . . 31

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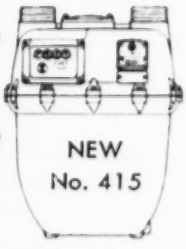

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Capacity 415 cfh
(at ½ in. diff. of 0.60 sp. gr. gas)
Weight only 19 lb.

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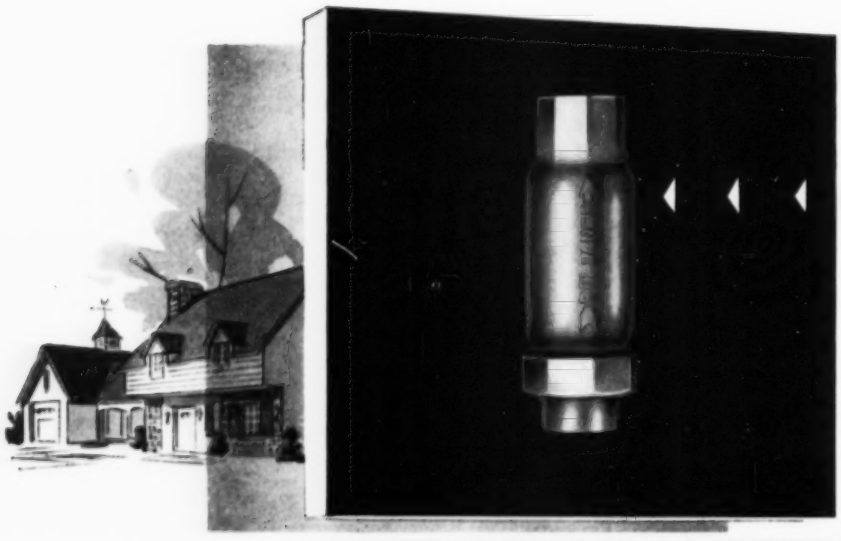

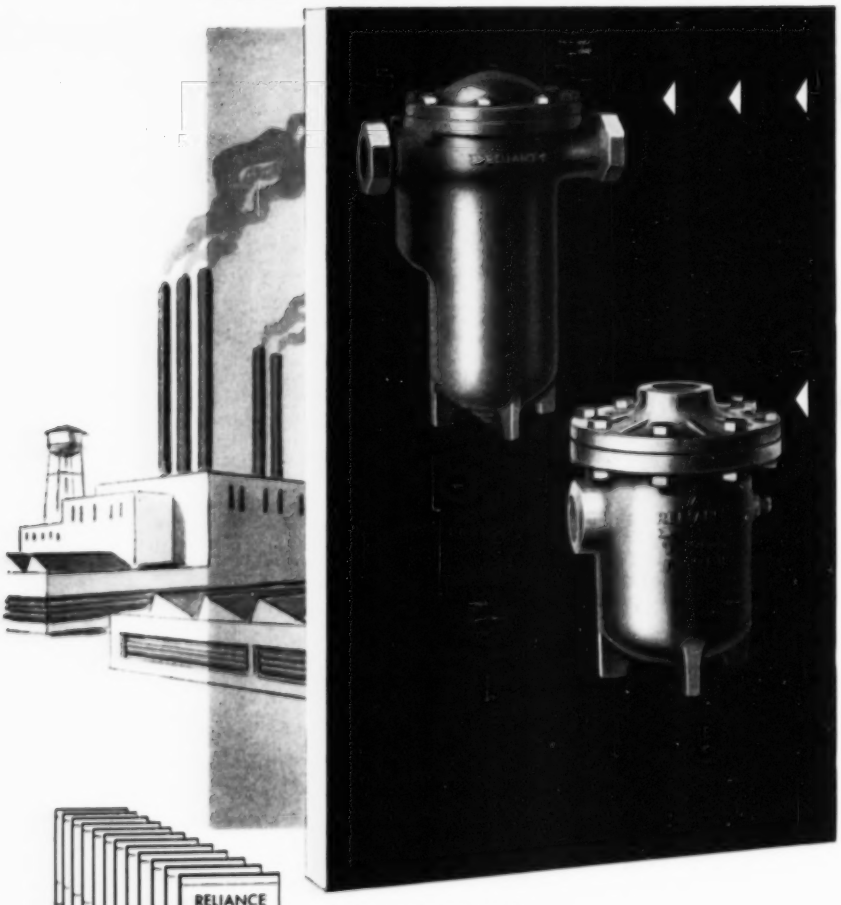

Reliance Bulletin 35C gives complete specifications. Write for your free copy today.

Here are three types of Reliance Filters to protect meters, regulators and gas appliances from impurities such as dust, dirt and scale.

TYPE "B" FILTER

This filter is used extensively with individual appliances such as water heaters, ranges, furnaces, etc., and is recommended for general use on house service lines in dust areas of the distribution system. It will protect the regulator, meter and house piping from dust, dirt, scale, etc. that prove so expensive in operation and maintenance. It is made with ¾" or 1" standard pipe connections. Replacement of filter elements, when necessary, can be made on the job. Filter may be in a horizontal or vertical position.

TYPE "C" FILTER

This high capacity filter is recommended for use on distribution and industrial services where larger volumes occur. The screwed type connections and the Series 15 flanged connections are suggested for working pressures up to 150 p.s.i. The Series 30 flanged unit is used for working pressures up to 300 p.s.i.

TYPE "D" FILTER

For normal industries use where comparatively large volumes occur, this new filter is highly recommended. The L-shaped flow allows cap to be changed for a 1¼" to 2" screw type connection. This filter is designed to handle working pressures up to 150 p.s.i. It contains 5 filter elements as compared to 9 for Type 'C'.

All Reliance Filters are made from special high tensile strength grey cast iron, developed in our own foundry and proven over a number of years. Interchangeability of individual elements has been maintained as much as possible. For dust-free gas, install Reliance Filters on your service lines.

AMERICAN METER COMPANY
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RELIANCE REGULATOR DIVISION
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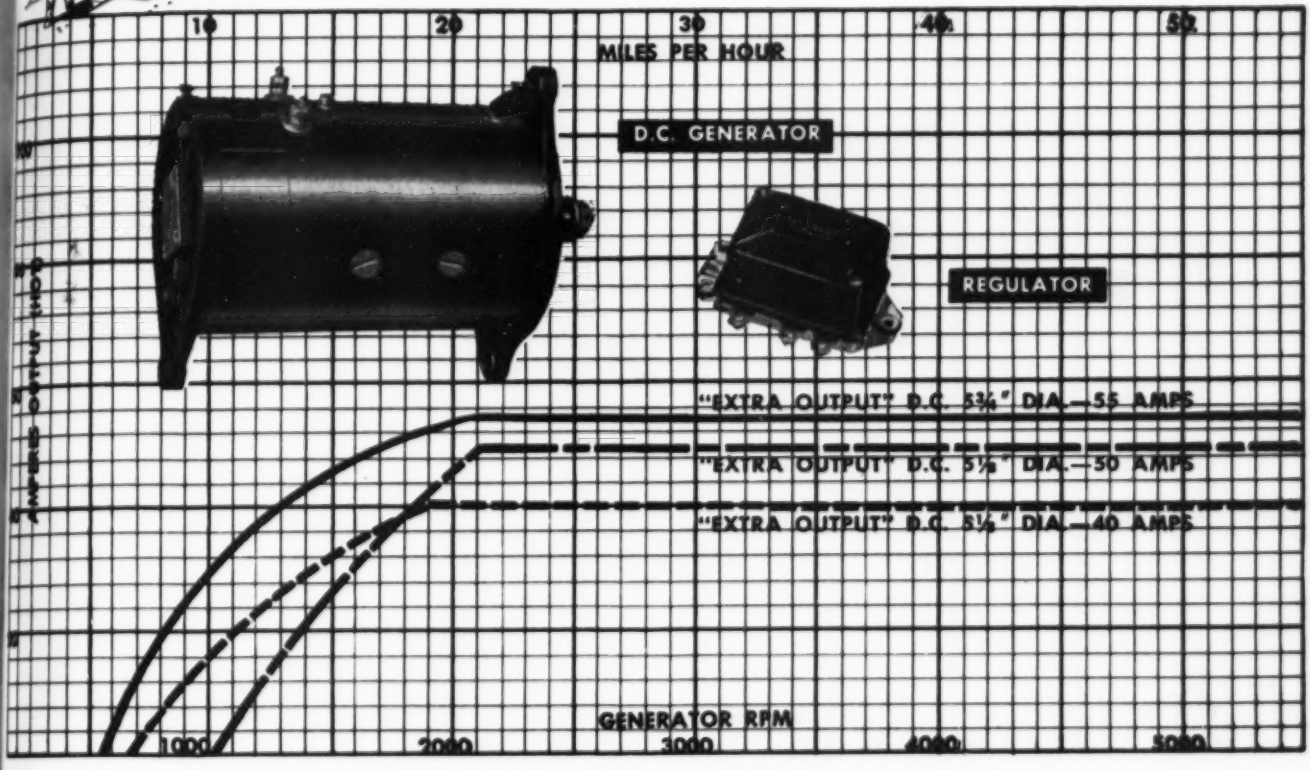
Right for the Job

HERE'S THE D.C. ANSWER TO HEAVY ELECTRICAL DEMANDS



DELCO-REMY

Extra-Output D. C. Generators and Matching Regulators

Delco-Remy extra-output D.C. generators are an economical answer to the electrical needs of public utility pickup or panel trucks as well as other vehicles with additional lights, two-way radios, or other special electrical equipment in medium to heavy-duty service. Delco-Remy extra-output D.C. generators are low in cost, simple to install, economical to maintain.

DELCO-REMY 40-AMP GENERATOR has low cut-in, about 7 mph, charges from 11 to 17 amperes at curb idle . . . full output about 18 mph —for vehicles customarily used in heavy traffic.

DELCO-REMY 50-AMP GENERATOR has slightly higher cut-in, about 11 mph . . . full output about 21 mph—for vehicles customarily operated at higher speeds, with minimum slow driving.

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WHEREVER WHEELS TURN OR PROPELLERS SPIN

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This is a view of Baltimore, from Federal Hill, as it looked about 100 years ago.

MODERNIZED cast iron

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When you have customers with an unbroken record of buying your product for over a century, you naturally prize them. They're scarce in any long-established business or industry. The cast iron pressure pipe industry is proud to have 60 such customers—utilities that have been buying cast iron pipe for gas or water mains for 100 years or more.

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Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.

This 10-inch cast iron gas main was laid in Baltimore over 120 years ago and is still serving. It is America's oldest functioning gas main.

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The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

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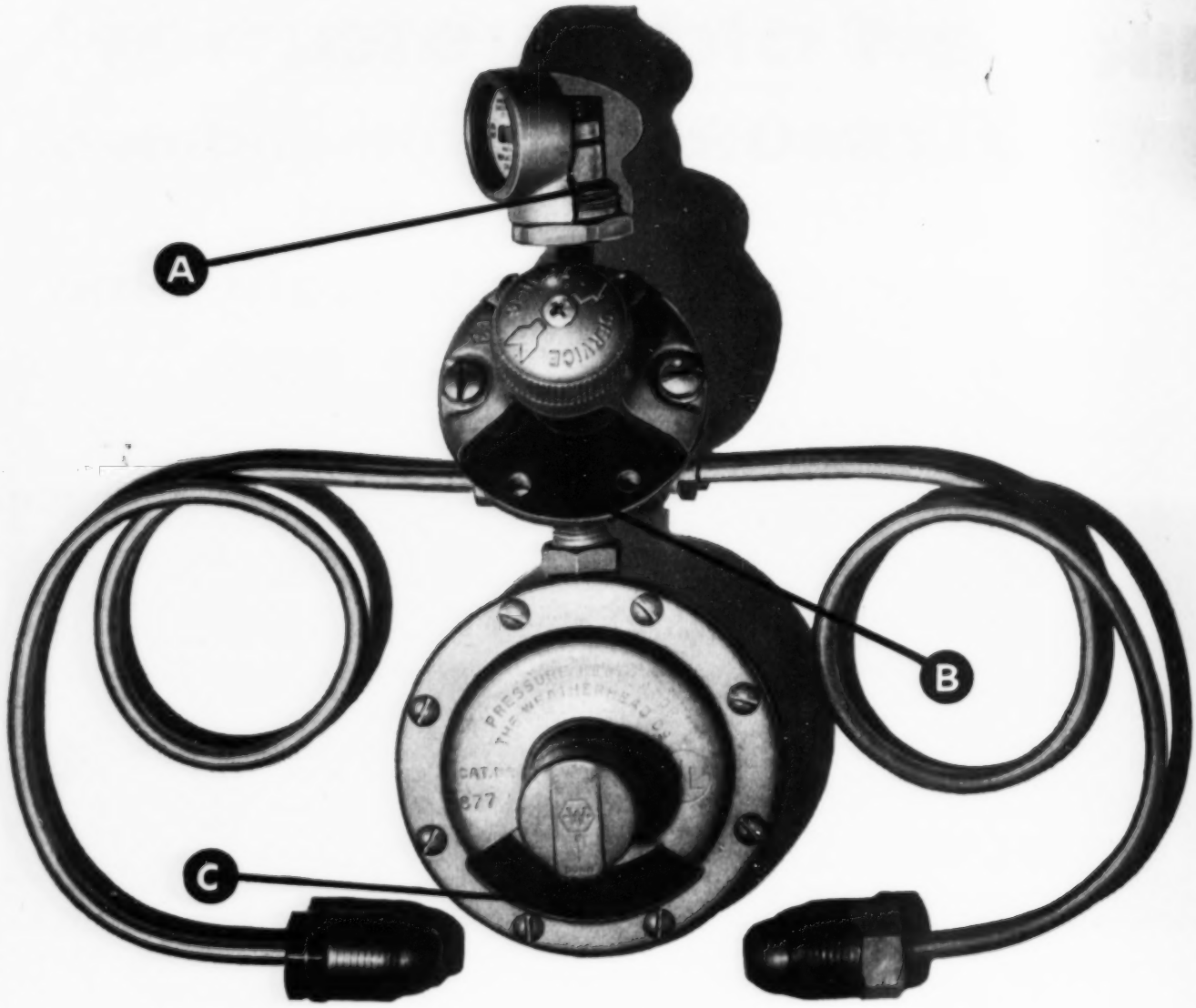

Three grades of Du Pont "Fairprene"® — *each with a different sensitivity*—used in Weatherhead Automatic Manifold

The Weatherhead Automatic Manifold reduces and regulates high pressures to the extreme accuracy needed for automatic LP-Gas appliances, and gives consumers an uninterrupted supply of gas.

Du Pont "Fairprene" synthetic elastic compositions play a vital part in the operation of the Weatherhead unit at three critical points. The small diaphragm in the gauge (marked "A" above) is molded from one grade of "Fairprene." In the first-stage automatic reducing unit (B) another grade of "Fairprene" is used. Both these materials combine extreme sensitivity with ability to withstand high pressures and continual flexing, in different degrees. For the second-stage regulator (C), even greater sensitivity was of paramount importance, so Du Pont developed a *special* grade of "Fairprene" to be used primarily in gas-regulator applications. Each "Fairprene" composition was selected because it was precisely suited to do its specific job.

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synthetic elastic compositions

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"Fairprene" is Du Pont's registered trade-mark for its line of products made from synthetic elastomers available in the form of coated fabrics, sheet stocks without fabric insert and adhesives.

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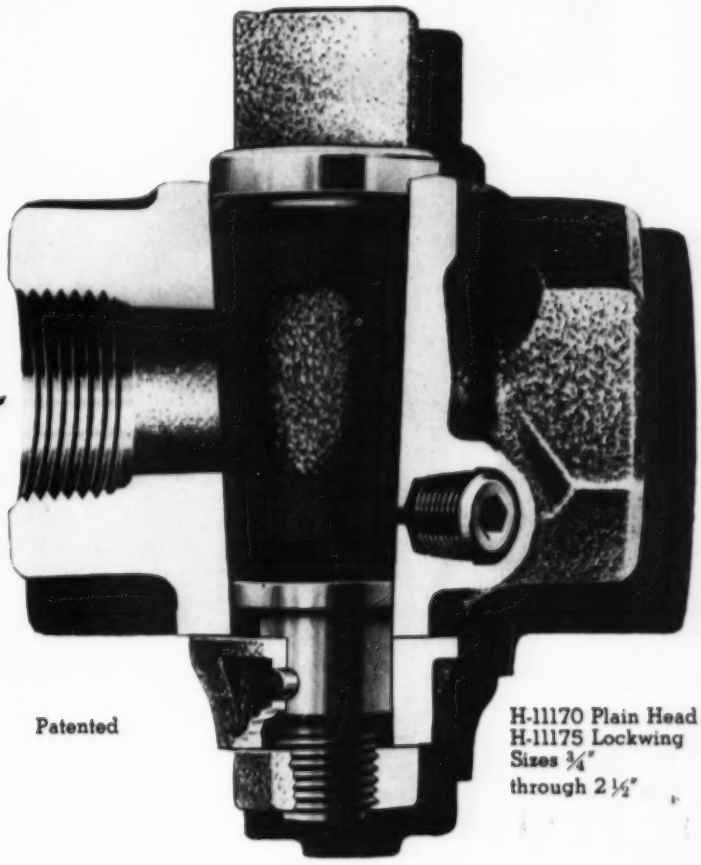
Eliminate Meter Stop Replacement with . . .



Patented

H-11170 Plain Head
H-11175 Lockwing
Sizes ¾"
through 2½"

LubOseal® Gas Meter Stops

Lub-O-Seal Gas Meter Stops have "O" rings which offer a permanent seal against gas leakage to the atmosphere. All of the precision ground and lapped surface of the key and body are pressure lubricated through an independent port in the body of the stop. Lubricant is "sealed in" and lubricant pressure maintained by "O" rings and ground key surfaces—stop retains its lubricating qualities for years—offers absolute protection against frozen keys. Original ease of turning is attained by re-lubricating stop.

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NO-BLO Method

MAKES SERVICE CONNECTIONS SAFELY...

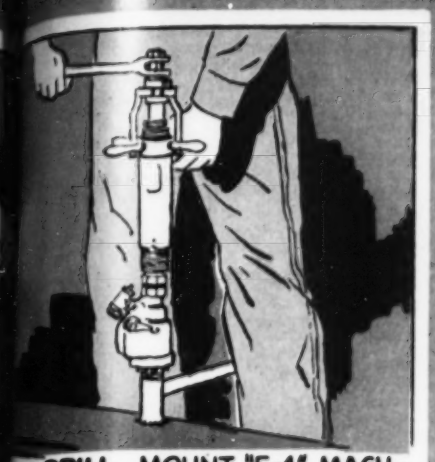
STEP 1 WELD. WELD TEE TO MA... AND COMPLETE SERVICE LINE TO F... STOP. TEST. ATTACH CONTROL CHA... BER OR GATE VALVE TO TEE.

with the MUELLER "E-...

STEP 3 PLUG. ASSEMBLE INSERT... ING TOOL AND COMPLETION PLUG... STEM AND BUSHING OR STEM - (DE... PENDING ON TEE USED) TO BORIN... BAR OF "E-4". REMOUNT MACHINE... OPEN VALVE AND INSERT.

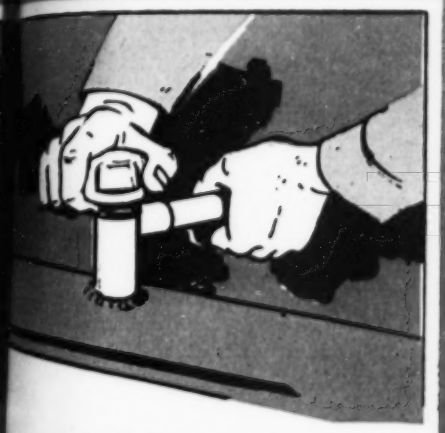
NO-BLO SERVICE TEE
For connections at the main where valve is not required but provision for future stop-off is desirable . . . "E-4" used to drill, insert plug and stop-off under pressure . . . welding or threaded inlet . . . welding, threaded or Dresser outlet . . . pressures to 1200 psi . . . sizes ¾" through 2".

NO-BLO VALVE TEE
For connections at the ... where valve is desired ... integral valve mecha... completely enclosed ... relatively tamperproof ... on premises as angle ... . . . no machine neces... operate valve . . . "E-4" ... to drill and insert stem ... bushing under pressure ... welding or threaded ... . . . welding, threaded ... Dresser outlet . . . pres... to 1200 psi . . . size... through 1¼"

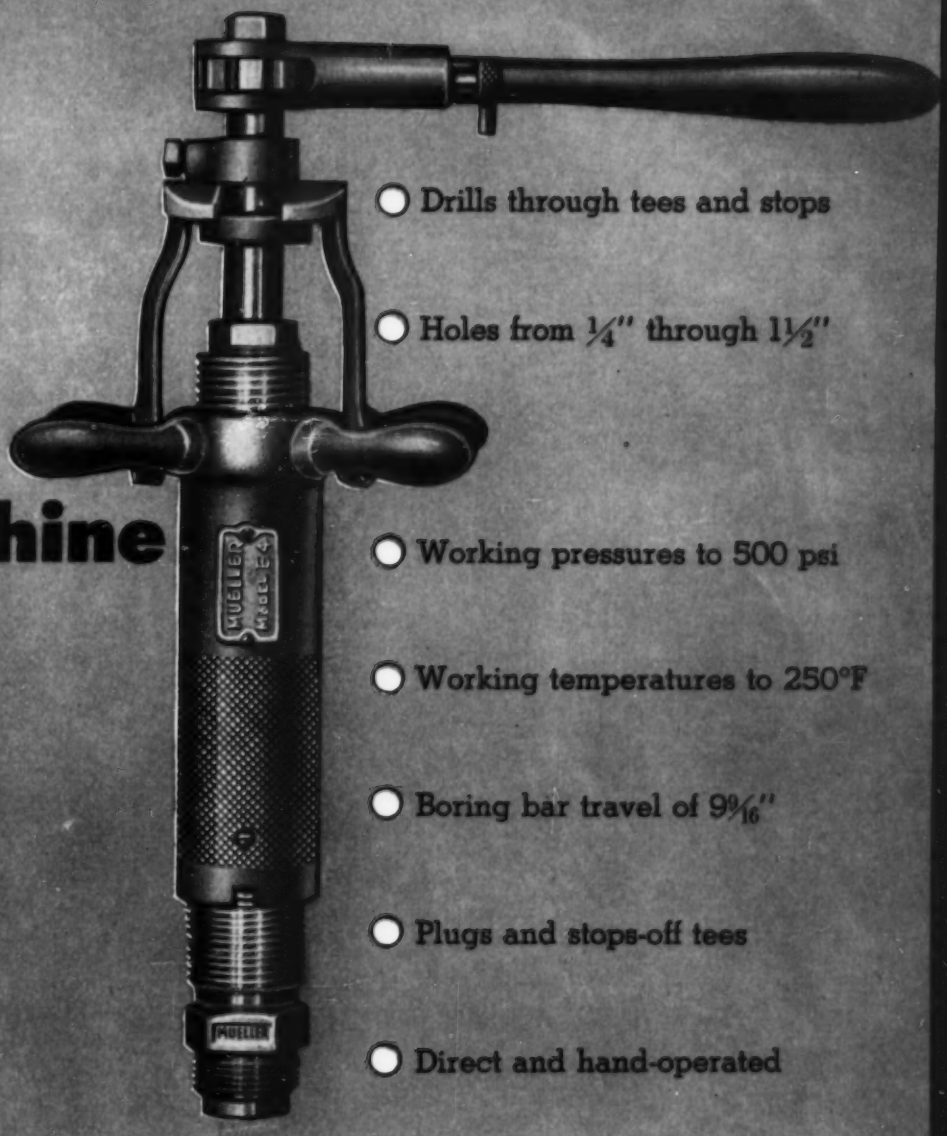


2 DRILL. MOUNT "E-4" MACH-
ON VALVE AND DRILL HOLE INTO
RETRACT DRILL, CLOSE VALVE
REMOVE MACHINE.

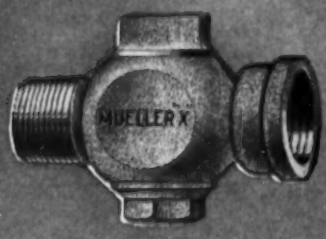
Drilling Machine



4 COMPLETE. REMOVE DRILL-
MACHINE AND VALVE. INSTALL
MPLETION CAP FOR DOUBLE SEAL.
ST FOR TIGHT SHUT-OFF.



- Drills through tees and stops
- Holes from ¼" through 1½"
- Working pressures to 500 psi
- Working temperatures to 250°F
- Boring bar travel of 9 9/16"
- Plugs and stops-off tees
- Direct and hand-operated



CURB VALVE TEE
connections to lines where
valve is desired . . .
from ground level
curb box . . . "E-4"
drill and insert stem
pressure . . . welding
ended inlet . . . "O"
stem and cap seals.
for high pressure farm
. . welding, threaded or
outlet . . . pressures
psi . . . sizes 1"
2"

NO-BLO GAS MAIN STOP
For connections at the main where valve is required . . . may be used with service clamp . . . "E-4" drills main through opened stop under pressure . . . I. P. inlet . . . inside or outside I.P. outlet . . . sizes ½" through 2" . . . single or double strap service clamps for pipe 1" through 12"

For additional information on the "E-4" and related NO-BLO Fittings consult your Mueller Representative or write direct.

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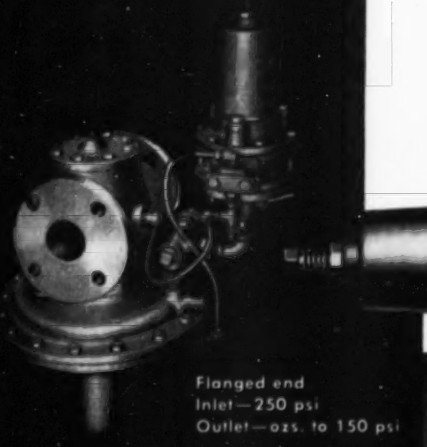
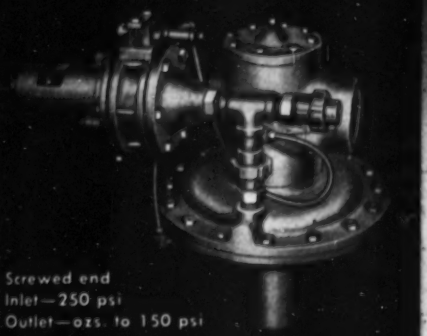
Chaplin-Fulton

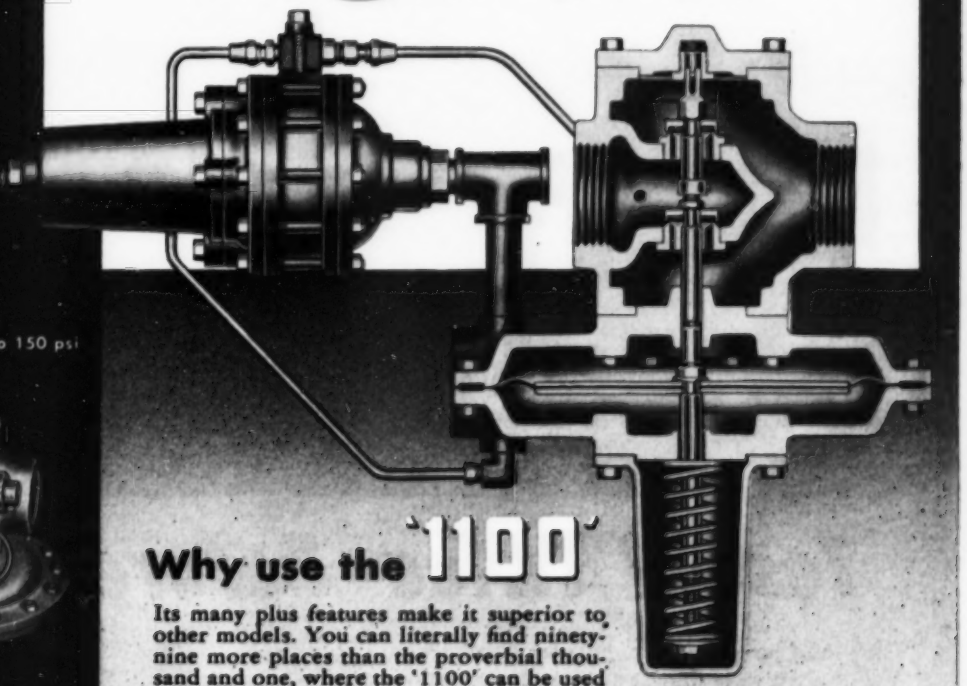
why? "1100" regulator



Flanged end
Inlet—250 psi
Outlet—ozs. to 150 psi



Screwed end
Inlet—250 psi
Outlet—ozs. to 150 psi



Why use the "1100"

Its many plus features make it superior to other models. You can literally find ninety-nine more places than the proverbial thousand and one, where the '1100' can be used to advantage.

One basic assembly-2"-screwed or flanged.

- **WIDER APPLICATION**—inches water to 150 psi controlled pressure—means less different types to stock and service.
- **GREATER CAPACITY**—balanced valve construction passes 114,000 CFH at 100 psi to ounces—replaces larger costlier regulators to reduce cost of whole installation.
- **PROVEN PERFORMANCE**—straight line control from minimum to maximum flow. Stable operation on quick changing loads, or with on-and-off controls. Fast low lock-up on zero flow.
- **SIMPLER CONSTRUCTION**—no intricate parts or delicate adjustments. All wearing parts easily replaced. Regulator or pilot can be serviced without disturbing the other.
- **EASIER INSTALLATION**—compact design requires little space for installation in any position. Just place in line and make one connection from regulator to outlet line.

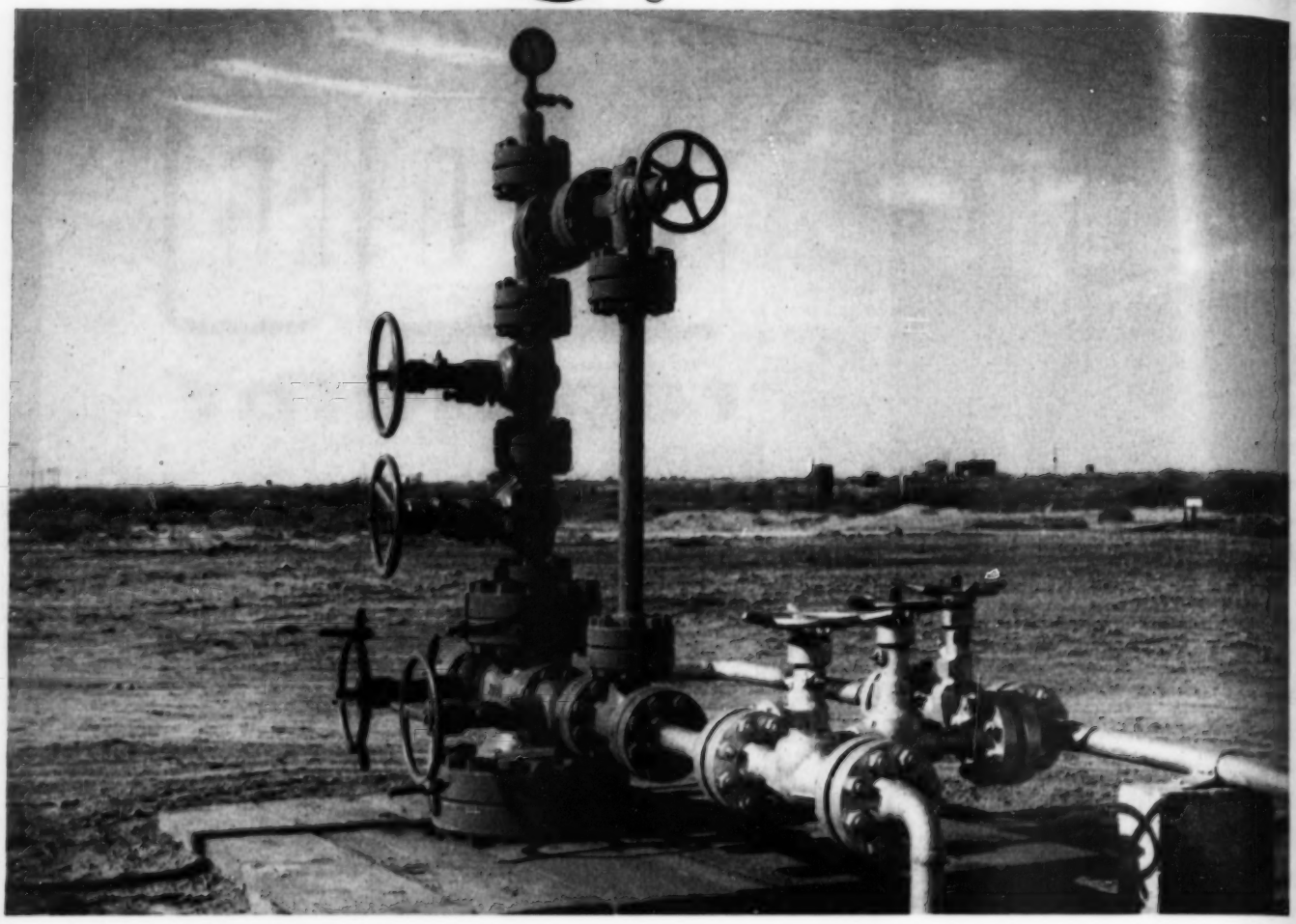
ACCURATE CP MFG CO DEPENDABLE

Chaplin-Fulton MANUFACTURING COMPANY

Bulletin 1100 with complete information sent on request.

54-1100

FORGED STEEL ORBIT VALVES® PRODUCTION VALVES



Tested Twice-Before Installation

Each and every Orbit Forged Steel Production Valve after assembly at the factory is subjected to a series of final tests. All testing is done with cold water. The downstream end of the valve body is plugged with the valve in an open position, full test pressure is applied rapidly several times then suddenly dropped, full pressure is then applied and maintained for long periods of time. This insures a good body test. The next step — we remove the plug or test flange, close the valve and apply full unbalanced pressure to the valve seat. This gives us a check on ease of operation and the valve's ability to hold pressure equal to or above its rated working pressure that will be stamped clearly upon the valve body before shipment.

Large numbers of Orbit Production Valves go into prefabricated christmas trees. It is a known fact that all reputable well head manufacturers rigidly test such equipment. Before a christmas tree can be tested — it first must be assembled, therefore when Orbit Forged Steel Production Valves are specified by you they receive another tough test by your favorite well head manufacturer.

BRANCHES

HOUSTON, TEXAS
407 Velasco
(Serving the Gulf)

CASPER, WYOMING
247 West First Street
(Serving the Rocky Mountain States and Canada)

ODESSA, TEXAS
402 West County Road
(Serving West Texas)

ORBIT VALVE CO.

P. O. BOX 699 TULSA, OKLAHOMA

No Blind Bargains for a Billion Dollar "Plant"

To Establish Conclusively the B.t.u. Content of the Natural Gas Gathered, Transported and Sold, the Great Transcontinental Lines use Cutler-Hammer Calorimeters

B.t.u.'s valuable enough to warrant a "plant" investment aggregating more than a billion dollars to transport them half way across a continent are too valuable not to be counted accurately. Because this is true and because return on this huge investment demands such accurate count, the great transcontinental natural gas pipe lines use Cutler-Hammer Calorimeters at gathering points in the southwest and distribution points in the rich industrial and domestic markets of the east. These Calorimeters are the *only instruments* that establish conclusively the B.t.u. count per cubic foot of gas flow in and gas flow out.

And because their markets and their franchises depend on delivering to the consumer a stable, dependable product, the municipal utilities served use Cutler-Hammer Gas Mixing Equipment. The C-H Calorimixer for high or low pressure gas and the C-H Jet type mixer automatically bring and hold the mixed gas to the stipulated figure by a process involving B.t.u. counting and flow control. Cutler-Hammer measuring and mixing equipment is available for every type of plant and any volume of gas flow. CUTLER-HAMMER, Inc., 1468 St. Paul Avenue, Milwaukee 1, Wisconsin.

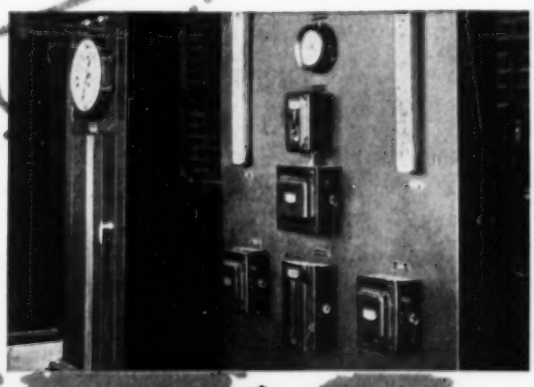
A PARTIAL LIST

of natural gas pipe lines using C-H Calorimeters and municipalities using B.t.u. metering and mixing equipment in the distribution, mixing and sale of natural gas.

Natural Gas Pipeline Co. of America
Northern Natural Gas Co.
Panhandle Eastern Pipe Line Co.
Southern Natural Gas Co.
Tennessee Gas Transmission Co.
Texas Eastern Transmission Corp.
Texas-Illinois Natural Gas Co.
Transcontinental Gas Pipe Line Corp.

Brooklyn	Evansville	Philadelphia
Chicago	Milwaukee	Pittsburgh
Detroit	New York	Etc., etc., etc.

And the Municipal Utilities served use Cutler-Hammer Calorimeters to check, and Cutler-Hammer Gas Mixing Equipment to stabilize, the heating value of the gas distributed.



C-H Calorimeters *(at left)* measure accurately and uncompromisingly the B.t.u. content of each unit volume of gas distributed regardless of temperature, pressure or flow variables, and write a continuous, available record.

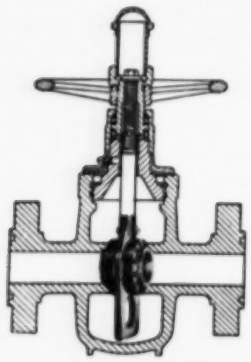
C-H Calorimixers *(in center)* automatically mix two or more high or low pressure gases of variable heating value in any volume, holding the final product undeviatingly to a stipulated figure.

CUTLER-HAMMER
B.t.u. CONTROL
C-H

C-H Jet type mixers *(at right)* automatically mix gases of variable heating value to a final low pressure stabilized value. When mixing directly into gas mains as well as into holders, they automatically adjust production to widely varying demands.

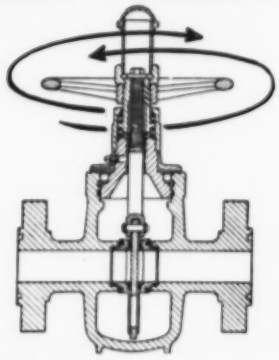
Here's everything you want in a gate valve

POSITIVE SHUTOFF—TIGHT AS A LINE BLIND



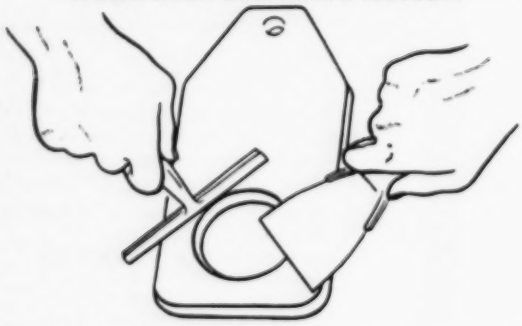
Positive dead-tight seal with pressure on either side of gate. Grove Seal-"O"-Ring Gate Valves also serve as a line blind.

LOWEST TORQUE—OPENING AND CLOSING



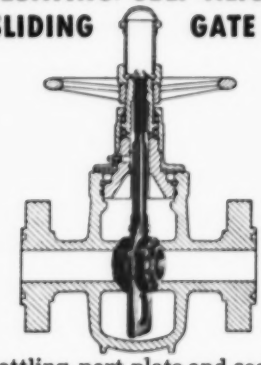
Parallel-sided full-opening port plate is non-wedging, non-galling, non-distorting. Torque required to open or close valve is less than other types of gate valves.

DUAL SELF-CLEANING ACTION



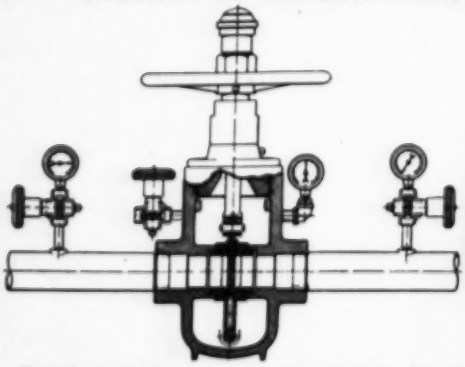
Steel seat assemblies and resilient "O" ring seals are in constant contact with full-opening port plate. Seating surfaces are stripped clean, squeegeed and polished with each operation.

FULL-FLOATING. SELF-ALIGNING FREE-SLIDING GATE ACTION

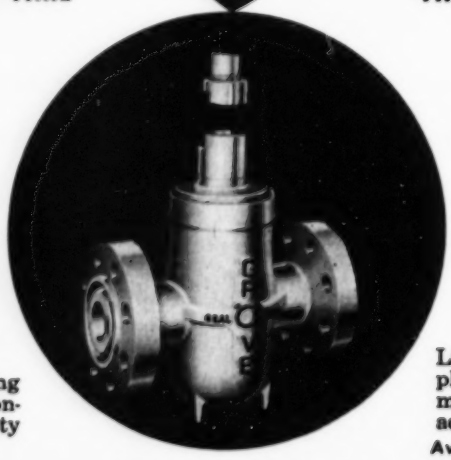


Open, closed or throttling, port-plate and seats are free-floating for perfect self-alignment, constant dead-tight seal, easy sliding action, imposing no strain or stress.

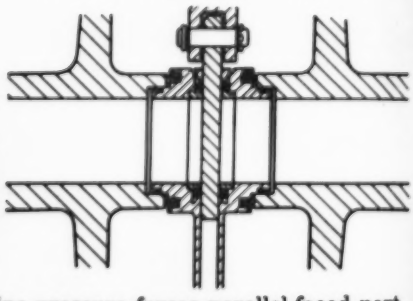
CHECK IT IN THE LINE—ANY TIME



Freedom of gate can be checked by turning hand-wheel, without "breaking" the seal. Non-variance of gauge pressure on body cavity verifies dead-tight seal of valve.



THE GREATER THE PRESSURE THE TIGHTER THE SEAL



Line pressure forces parallel-faced port plate against seat assemblies for positive metal-to-metal seal plus dual sealing action of resilient "O" rings.

Available through leading oil field supply houses

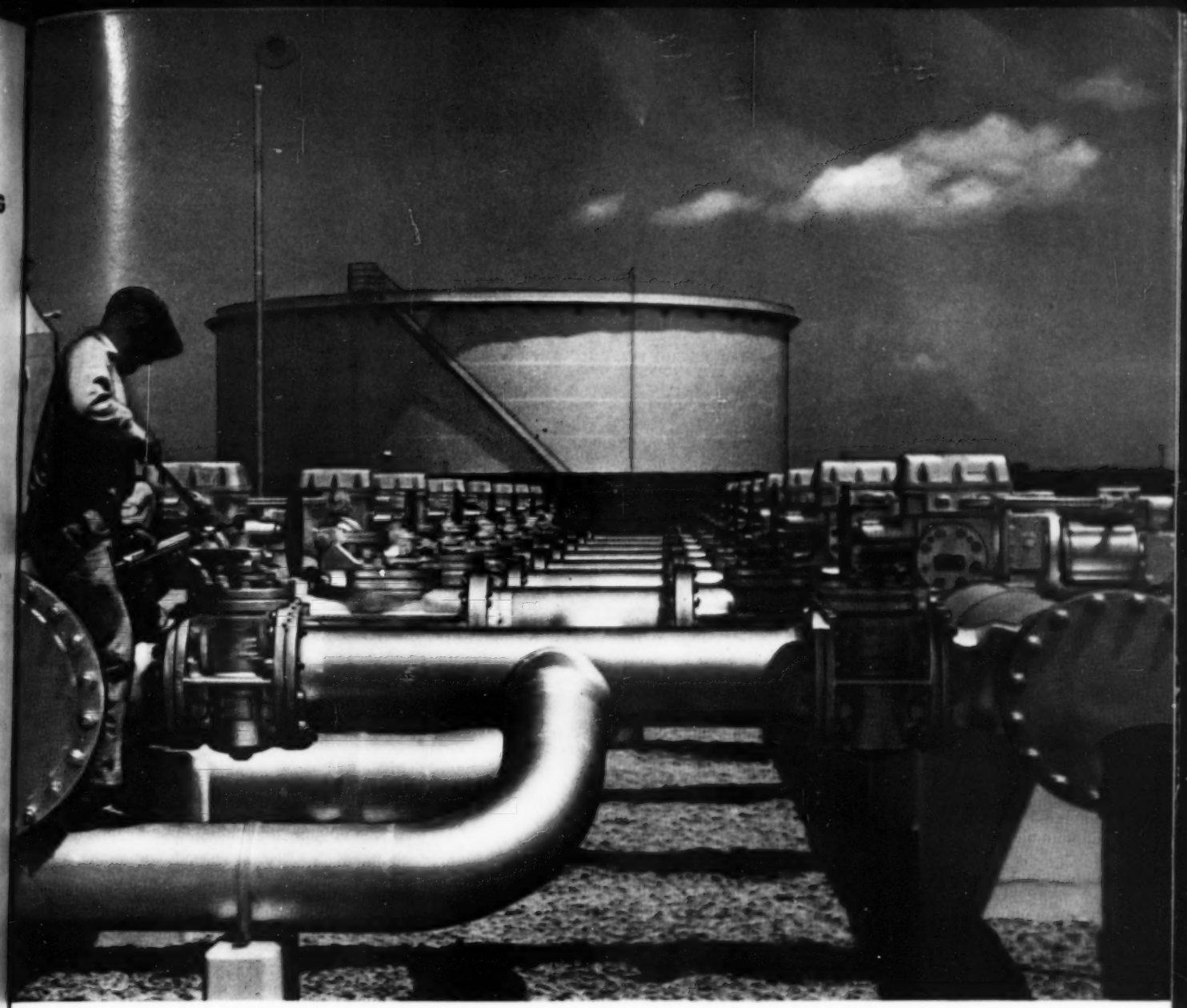
GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California

HOUSTON 4—1901 Calumet St. • **LOS ANGELES 6**—1930 W. Olympic Blvd. • **NEW YORK 17**—415 Lexington Ave.

GROVE SEAL O RING — GROVE — SIMPLICITY ACCURACY SAFETY

CORPUS CHRISTI, TEXAS ODESSA, TEXAS TULSA, OKLAHOMA LAFAYETTE, LA. NEW ORLEANS, LA. DENVER, COLO.



PICTURE OF MAINTENANCE COSTS BEING LOWERED

Every plant that keeps complete records comes to the same conclusion—periodic valve lubrication *saves* money; it's valve failure and replacement that sends maintenance costs skyward.

That is the basic fact behind the Rockwell-Nordstrom valve design, for the internal lubrication system eliminates most reasons for valve failure—Rockwell-Nordstrom lubricant *prevents* galling, jamming, abrasive wear, and seepage.

Systematic lubrication of Rockwell-Nordstrom valves with the right Rockwell-Nordstrom lubricants inevitably leads to lower operating costs. There is no substitute for Rockwell experience—use it to save money on valves. *Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.*

THREE WAYS
THE NORDSTROM LUBRICANT WORKS

1. Lubricant surrounds each valve port with a vapor tight pressurized seal. **Nordstrom valves stay tight.**
2. Lubricant acts as hydraulic jack—a fast quarter-turn to open or close. **Nordstrom valves operate quickly.**
3. Lubricant coats the plug for sliding action—no wear-producing wedging. **Nordstrom valves operate easily.**

Rockwell Built

NORDSTROM VALVES

Lubricant-Sealed for Positive Shut-Off

WHICH PRODUCT IS EASIEST TO MAKE?

Every manufacturing process has its own special problems. There's no fair way to compare the difficulties of processing paint and paper, or of synthetic rubber and synthetic textiles, for instance.

In every process industry, too, there are special problems of flow control, and no matter what claims you read, there is no such thing as an all-purpose valve.

Undoubtedly, Rockwell-Nordstrom valves approach that point more closely than others because they use the Nordstrom-originated principle of internal lubrication. Rockwell-Nordstrom lubricants seal tightly in gas, liquid or slurry service, and at the same time make operation easy, and eliminate galling or seizing.

Further, Rockwell-Nordstrom makes the widest range of sizes, pressure classes, metals and lubricants, so that for any process, you're wise to check first with *Rockwell Manufacturing Company*, *Pittsburgh 8, Pennsylvania.*

Nordstrom Valves

Another Quality ROCKWELL Product

BIG DOLLARS

Ride on a Crane's Stability

Bucyrus-Erie Hydrocrane Brings Them Your Way

Here the Hydrocrane unloads gas pipe. With truck springs locked out and crane stabilized by outriggers, control is so precise loads can be moved a fraction of an inch, if necessary. You will speed up operation, reduce damage, handle more jobs at greater savings with a fully stabilized Hydrocrane or Hydrohoe. Here's another advantage. If crane gets stuck, you can jack it up with the outriggers.

The matchless stability of the Bucyrus-Erie Hydrocrane puts you dollars ahead both in operating accuracy and smoothness, and in lower crane maintenance.

Four husky hydraulically operated outriggers extend horizontally and vertically in seconds — through controls at the operator's station. Individual control of each outrigger makes it possible to level crane quickly on uneven ground — without cribbing or blocking.

NO SPRING DEFLECTION. There's no bouncing and swaying, due to flexing of tires and springs. An automatic lock-out device immobilizes truck springs and eliminates spring deflection while crane is working. The outriggers take the load entirely off the tires. That's an important advantage for erection work, handling of fragile material, or precise excavation because any deflection is greatly magnified at the boom point.

Because the outriggers extend the fulcrum point for greater leverage the Hydrocrane needs no counterweight and actually outlifts heavier machines. Outriggers form an integral part of crane sub-base and easily accommodate the maximum load the crane can lift. No twisting, wracking strains on spring and truck chassis — no heavy load to blow out tires.

BUCYRUS ERIE

Let your Bucyrus-Erie distributor demonstrate the advantages of a Hydrocrane on *your* work.

BUCYRUS-ERIE CO.

South Milwaukee, Wisconsin

Gentlemen:

Please send me full details on the following:

- ☐ Self-powered and standard Hydrocrane
- ☐ Remote control Hydrocrane-Hydrohoe
- ☐ Self-powered and standard Hydrohoe
- ☐ Wrist-action dipper for Hydrohoe

NAME_____

COMPANY_____

ADDRESS_____

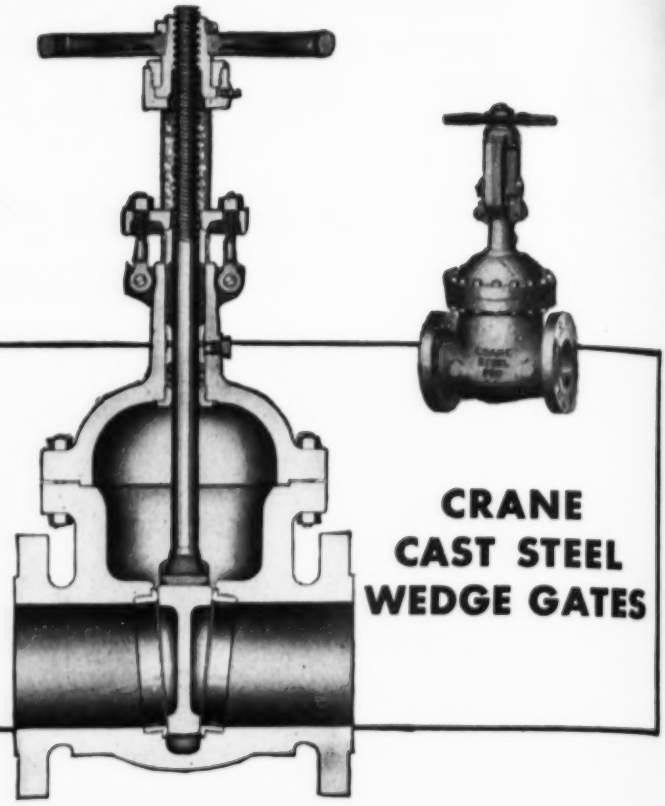
CITY_____ STATE_____

50H54

let valves of
known dependability
keep your piping costs
in line

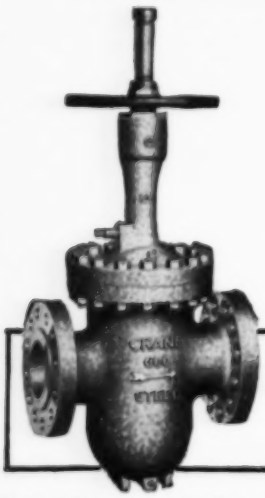
CRANE

Here are some of the most famous valves in pipeline service—famous for their greater suitability, dependability, and long-range economy. The consistent success of Crane pipeline valves is easy to understand when you consider the background . . . dating clear back to the early days of the petroleum industry.



CRANE CAST STEEL WEDGE GATES

The pioneer steel valve that has never been topped in quality and performance. A stronger and more rugged valve because of Crane skill in steel casting. Dependable wedge gate design with solid wedge-type disc. Long, close-fitting guides assure accurate seating—minimize wear. Crane *Exelloy* trim on all seating surfaces provides the resistance you want against erosion and wear. Deep, lantern-type stuffing box assures tightness and long packing life. Crane Cast Steel Wedge Gates are available in a wide range of sizes with flanged and welding ends; 150, 300, and 600 lb. class.

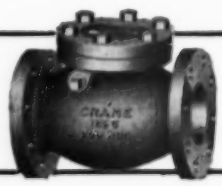


CRANE CONDUIT-TYPE GATES CLASS 600

Even infrequent operation won't affect their efficiency, for all working parts are sealed in grease. Dual-seating double disc is fully seated in open as well as closed position, thereby solving erosion problems. Conduit-type disc ports coincide exactly with seat openings for smooth, clear flow with minimum pressure drop. Full-Way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch.

CRANE IRON BODY WEDGE GATES

You see plenty of these dependable 125-pound Crane valves along the nation's pipelines. Adaptable for all types of services, they feature an exceptionally strong oval-shaped body and bonnet. Available with either double disc or solid wedge disc. OS&Y and non-rising stem patterns, brass trimmed or all-iron. Screwed or flanged end valves available. Complete range of sizes.



CRANE IRON BODY SWING CHECKS

Well-proportioned, sturdy valves, globular in shape to provide ample flow. *The disc cannot stick in open position.* All-iron or brass trimmed, whichever your service demands. All-iron valves have seating surfaces cast integral with body and disc. Seat ring in brass-trimmed valves is screwed into the body. All sizes have the hinge suspended in the body, permitting simplified change-over to outside lever and weight. Sizes up to 24 inch.

THE BETTER QUALITY . . : BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CASE STUDY

150,000 RECORDS

handled faster • more efficiently • at lower cost

ROCHESTER GAS & ELECTRIC CORP. SOLVES CREDIT-HISTORY RECORD PROBLEM WITH

DIEBOLD

Super Elevator Files

THE PROBLEM: Former equipment spread work too far . . . made operators waste time walking, getting up and down, restoring files after each use . . . couldn't be expanded for increased volume within space available.

THE SOLUTION: Three Diebold Super Elevator Files, replacing approximately 2,000 slide visible files, provided needed expansion and enabled credit department to release 342 sq. ft. (45%) for other use . . . saved 43% in time . . . eliminated 26% of operations, 55% of walking . . . improved working conditions.

The case history of this motorized Super Elevator File installation is full of usable ideas for everyone working with mass-record systems. It shows how bringing records to operators' finger-tips by touching a button pays dividends . . . big dividends. Send for your copy today.

Diebold®

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The complete line for handling and protecting records and money since 1859.

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982 Mulberry Rd., S.E. • Canton 2, Ohio

Please send a copy of Rochester Gas case history and full information on Super Elevator Files for our _____ records.

Firm _____

Individual _____

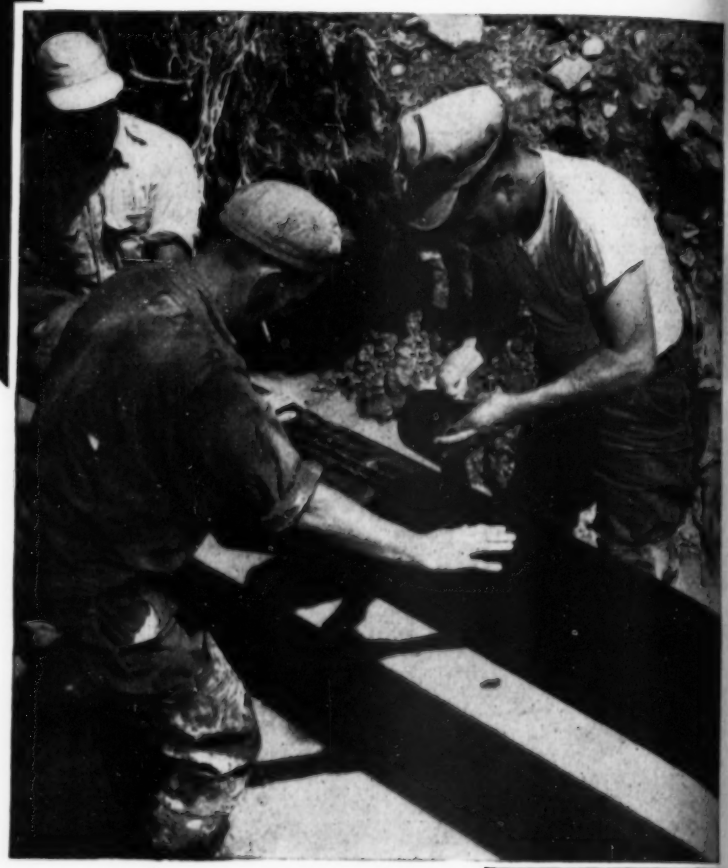
Title _____

Street _____

City _____ Zone _____ State _____

DRESSERTAPE*

the modern protection against pipe corrosion!



FAST, EASY, SAFE TO APPLY

Applied cold—by hand or simple portable tool—modern, pressure-sensitive Dressertape bonds securely to the pipe . . . assures uniform protection on top, sides and bottom.

PROTECTS PIPE, JOINTS, FITTINGS

Highly versatile, Dressertape is widely used for coating field-welded joints on all diameters of mill-wrapped pipe . . . for complete coating of pipe sections in yard or ditch . . . for repairing holidays and gaps in other types of coating. Readily conforming to the contours of small diameter fittings, narrow-width Dressertape is ideal for service line use.

GIVES LASTING PROTECTION

High dielectric Dressertape provides excellent electrical insulation . . . also permanently protects all underground piping against corrosion by soil chemicals, salt water, acids, alkalies and oil.

For complete details, send for Dresser "Corrosion Control" catalog.

*DRESSERTAPE is a trademark of Dresser Mfg. Division

The Tapester Special, available through Dresser, assures speedy, uniform coverage on small diameter pipe.

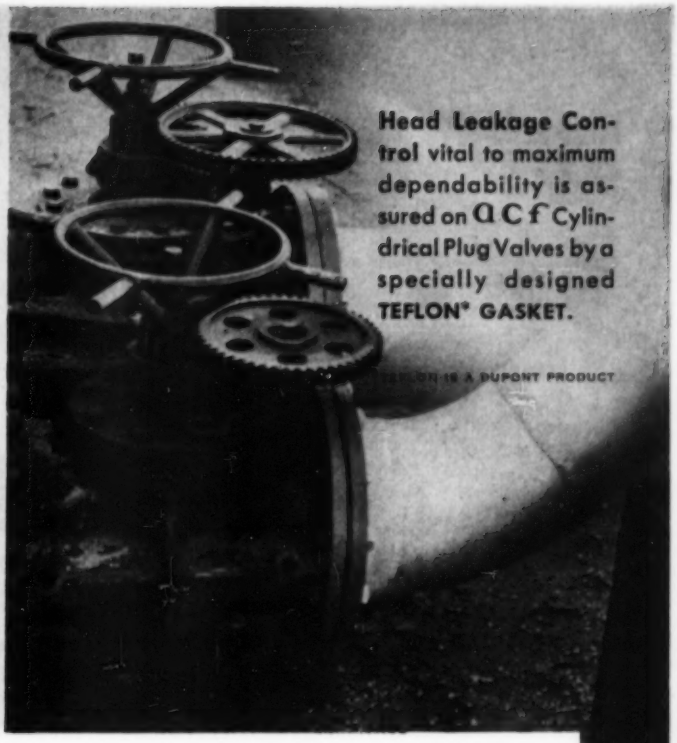
Larger model Tapesters, also available through Dresser, spin Dressertape protection on piping 2" in diameter and larger.

Dressertape is available in 10 mil and 20 mil thicknesses, all widths

DRESSER® MANUFACTURING DIVISION

Dresser Manufacturing Division, 89 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales offices also in: New York, Philadelphia, Chicago and Toronto.

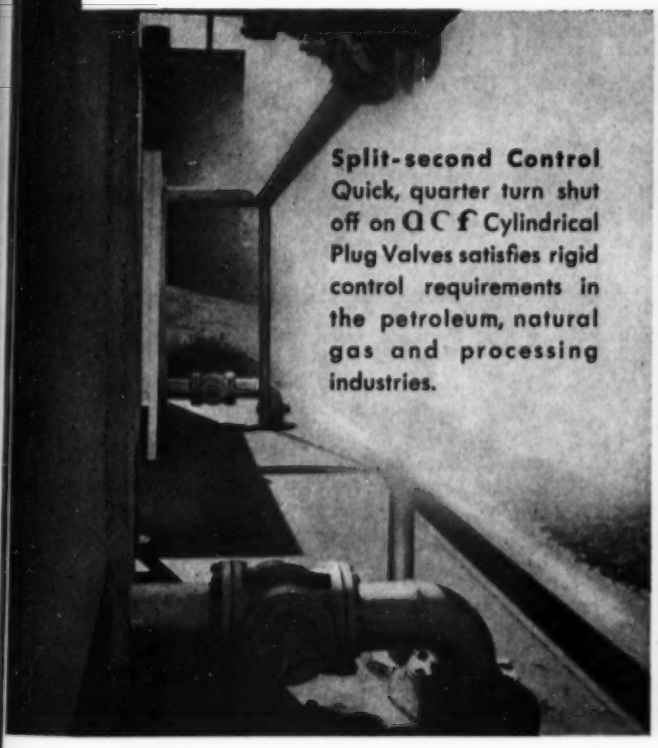
Knife-edge Rotary Action of the acf Cylindrical Plug Valve clears obstructions, eliminates stoppages, insures constant flow.



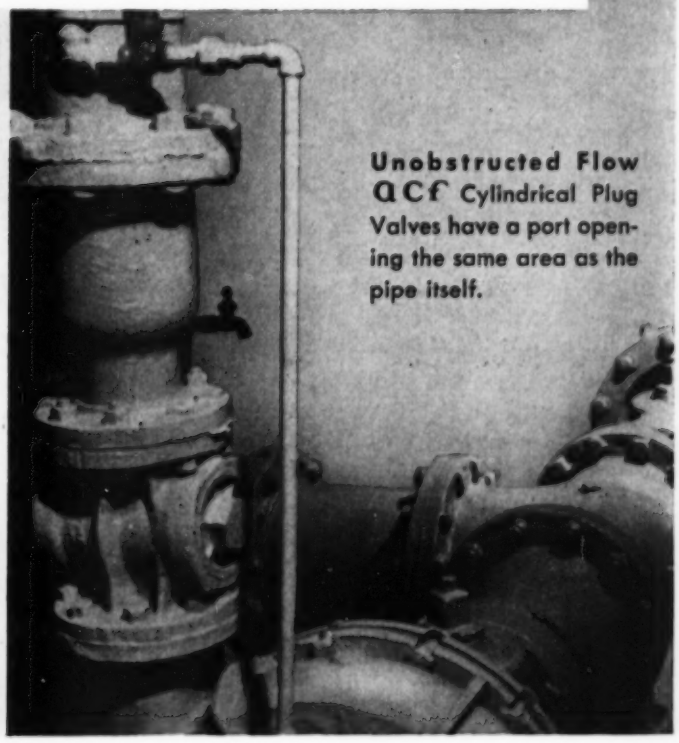
Head Leakage Control vital to maximum dependability is assured on acf Cylindrical Plug Valves by a specially designed TEFLON* GASKET.

*TEFLON IS A DUPONT PRODUCT

QUALITY THAT PAYS OFF



Split-second Control Quick, quarter turn shut off on acf Cylindrical Plug Valves satisfies rigid control requirements in the petroleum, natural gas and processing industries.



Unobstructed Flow acf Cylindrical Plug Valves have a port opening the same area as the pipe itself.

Rectangular Port and Full Round Port

acf

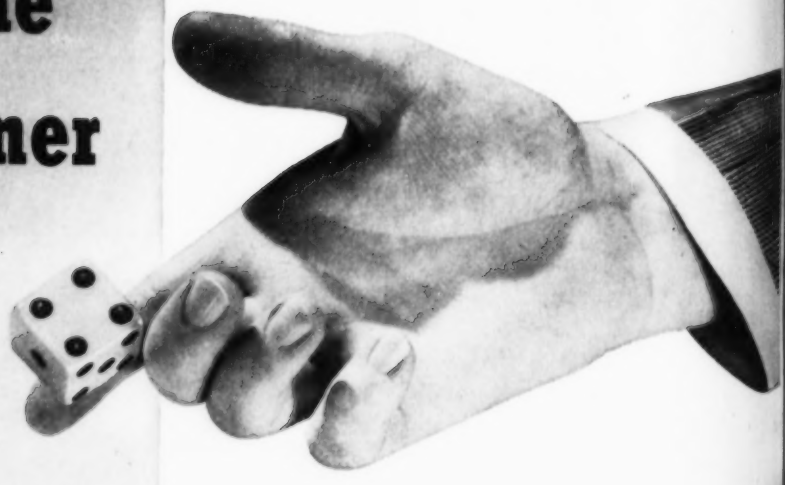
Representatives in 50 Principal Cities

CYLINDRICAL FULL PIPE AREA

PLUG VALVES

Write for descriptive Catalog 5-G to
acf Industries, Incorporated, Valve Division,
1301 E. Ferry Avenue, Detroit 11, Michigan.

Don't Gamble With Customer Good Will



STAYNEW IS A NATURAL

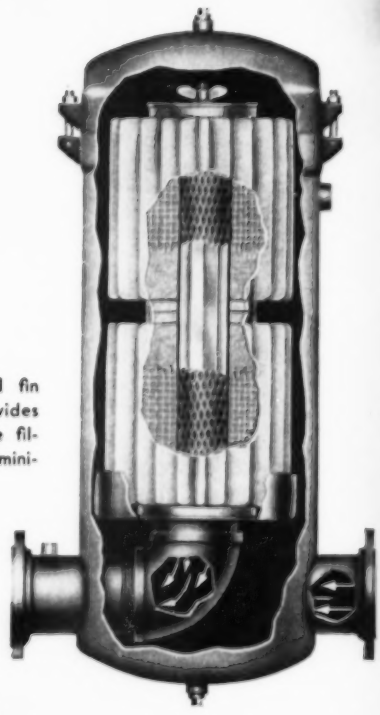
FOR EFFICIENT GAS FILTRATION

CONVERSION to natural gas brings problems if proper filtration is not provided. And . . . customer complaints increase as pilot and house regulators get clogged.

Staynew Model CPHG Filters with the new WRC-22 Medium are doing an outstanding job for many utilities by cutting operating costs, reducing excessive service calls and maintaining customer good will.

Put your money on this Staynew Filter. Available in a wide variety of sizes at any working pressure desired up to 5000 pounds—it is a sure bet to win new friends.

For complete information write for Bulletin 290.



Staynew radial fin construction provides maximum active filtering area in minimum space.

DOLLINGER PROTECTO-MOTOR STAYNEW FILTERS

Representatives in Principal Cities

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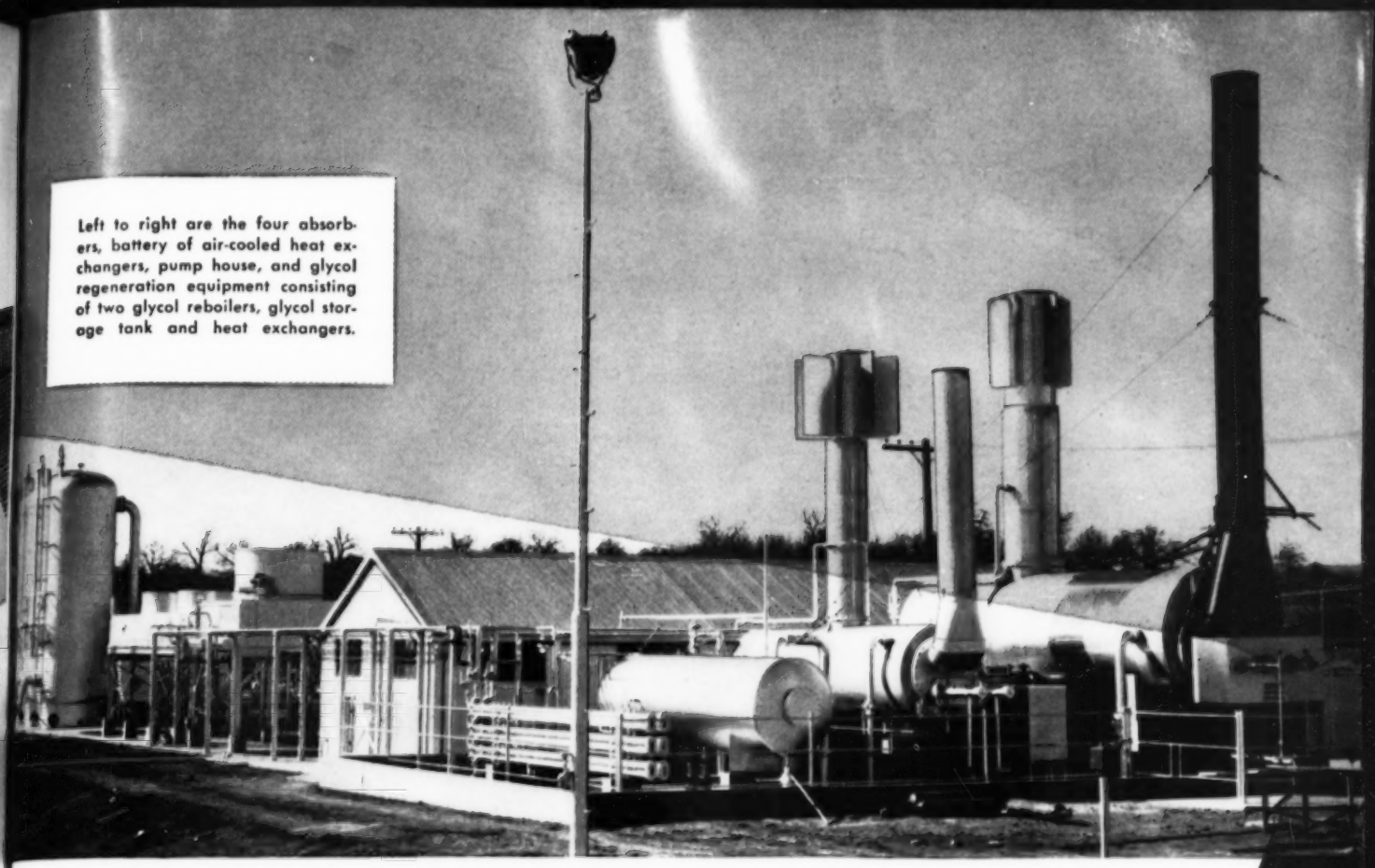


Left to right are the four absorbers, battery of air-cooled heat exchangers, pump house, and glycol regeneration equipment consisting of two glycol reboilers, glycol storage tank and heat exchangers.

560,000,000

SCF OF RESERVOIR GAS PER DAY...

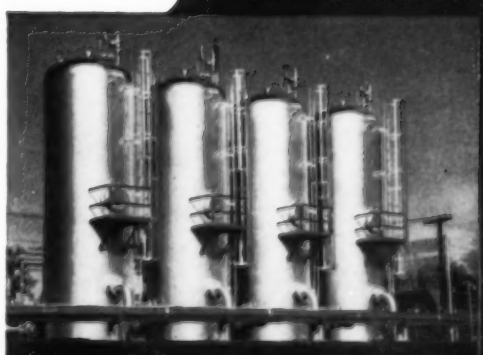
. . . Can Be Dried In This BS&B Built Dehydration Plant At Depew, Oklahoma!

When Oklahoma Natural Gas Co. wanted to double the capacity of their Dehydration Plant serving their 57 billion cubic foot underground gas reservoir near Depew, Oklahoma, they called in BS&B — designers and builders of the original plant.

The job was accomplished within a few months by the addition of two new absorbers, and by doubling the capacity of the cooling system and the glycol reactivation equipment. At the same time, provision was made for additional plant expansion when the need arises.

Present capacity of the plant is 560,000,000 SCF/D at 800 psi pressure. During one month when 4,600,000,000 cubic feet of gas was withdrawn from the reservoir and processed through the new plant, the amount of moisture removed from the gas was equivalent to 20,000 gallons of water!

If you have a dehydration problem —at the well head, at a field processing installation or along the pipeline—why not take advantage of BS&B's many years of successful experience in solving it? Your BS&B Representative will be glad to discuss it with you . . . or you may write



OIL & GAS EQUIPMENT DIVISION, DEPT. 1-BQ9

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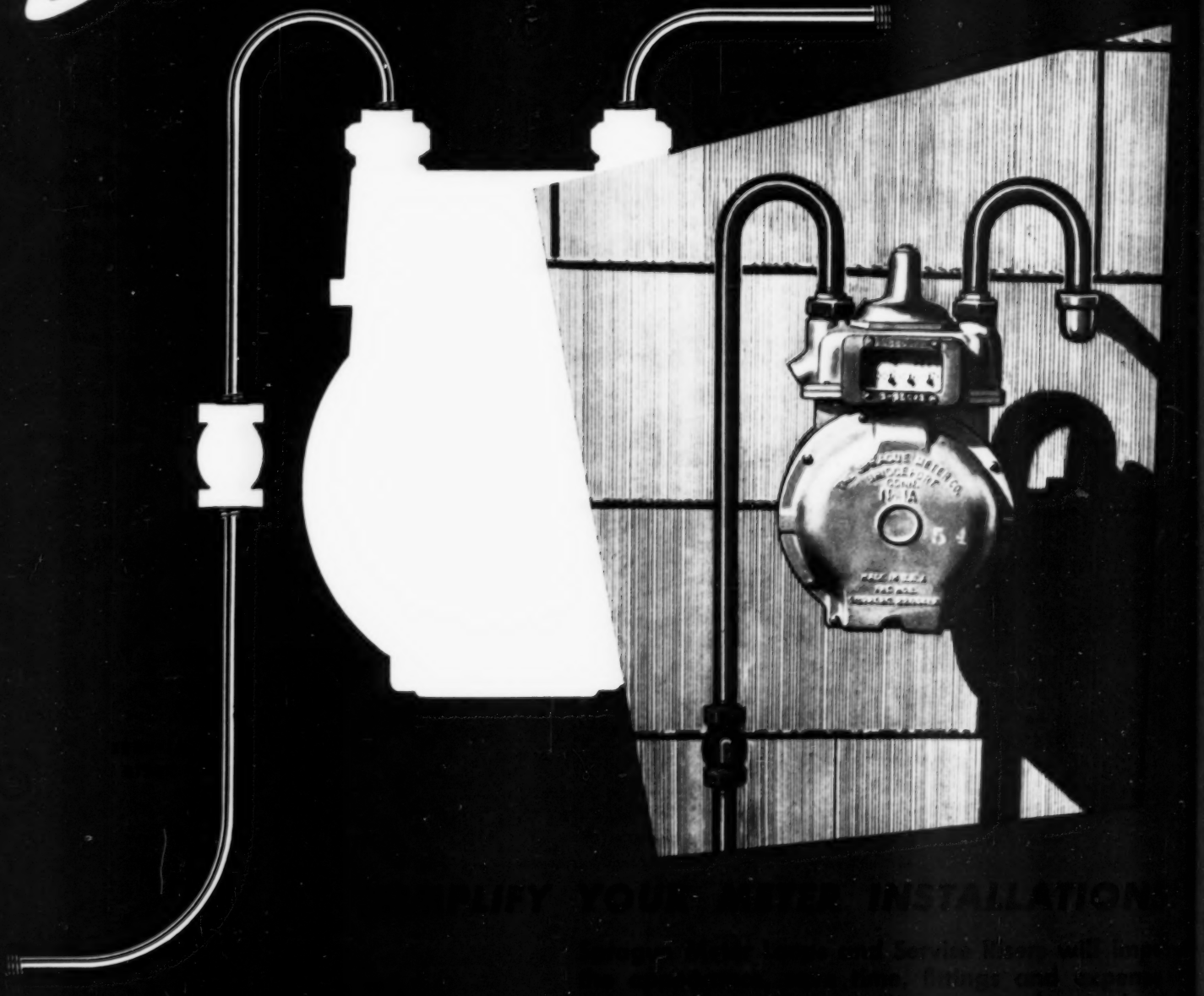

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